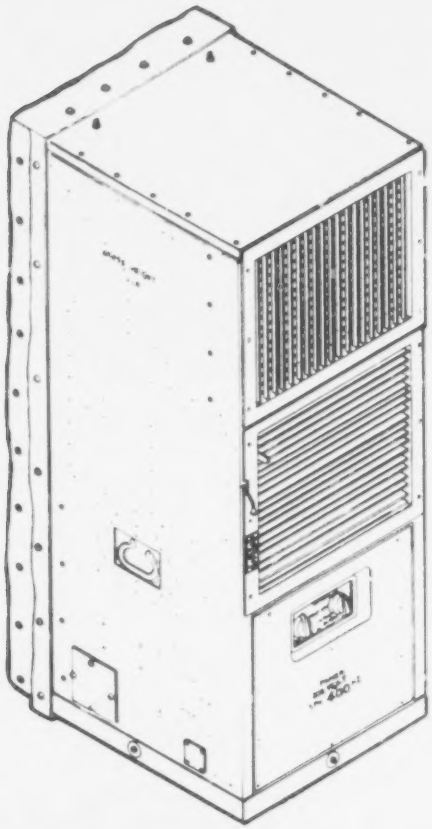
5-4120-377-14

TM 5-4120-377-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL



AIR CONDITIONER, VERTICAL, COMPACT, 18,000 BTU/HR 208 VOLT, 3 PHASE, 400 HERTZ

NSN 4120-01-127-0716

This copy is a reprint which includes current pages from Change 1.

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HEADQUARTERS, DEPARTMENT OF THE ARMY
19 SEPTEMBER 1983

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TM 5-4120-377-14
C 1

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 June 1988

Operator's, Organizational,
Direct Support and General Support
Maintenance Manual

for

AIR CONDITIONER, VERTICAL, COMPACT, 18,000 BTU/HR
208 VOLT, 3 PHASE, 400 HERTZ
KECO MODEL F18T4-2S NSN 4120-01-127-0716
APPLIED MODEL 3788 NSN 4120-01-220-7391

TM 5-4120-377-14, 19 September 1983, is changed as follows:

1. Title is changed as shown above.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
v and vi	v and vi
1-1 and 1-2	1-1 and 1-2
1-5 and 1-6	1-5 and 1-6
2-1 through 2-4	2-1 through 2-4
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5-29 through 5-32	5-29 through 5-32
---	5-32.1/5-32.2
A-1/A-2	A-1/A-2
I-5 and I-6	I-5 and I-6

3. Retain this sheet in front of manual for reference purposes.

TM 5-4120-377-14
C 1

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator, Unit, Direct Support and General Support Maintenance requirements for Air Conditioner, Vertical Compact, 18,000 BTU, 208V, 400HZ, 3PH (F18T4-2S).

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate.

WARNING

Do not use steam to clean coil.

WARNING

Do not use steam, open flame, heat gun, or any other high-temperature heat source to thaw an iced coil. Thaw an iced coil by operating unit in high heat mode, with a lamp bulb (75 watt maximum), hair dryer, electric fan, or by leaving unit shut down until ice melts.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2). Do not direct compressed air against skin. Use goggles or full face shield.

WARNING

Avoid inhaling fumes and burns from acid formed by burn out of oil and refrigerant. Wear gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands. Use care to avoid spilling compressor burn out sludge. If sludge is spilled, clean area thoroughly.

WARNING

Avoid injury by using adequate equipment and personnel to remove compressor from frame. The compressor weighs 85 pounds (38.6 kg).

WARNING

Clean parts in a well ventilated area.
Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly.

Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property.

Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 psig (2.1 kg/cm^2).

Assure industrial process has been evaluated by Medical Service Bioenvironmental Engineer.

Waste treatment/disposal must be approved by Medical Service Bioenvironmental Engineer and Civil Engineer.

WARNING

Solutions will be disposed of in accordance with local State Water Pollution Control Laws. Consult local Medical Services for guidance.

WARNING

HIGH VOLTAGE

is used in operation of this equipment

DEATH ON CONTACT
may result if personnel fail to observe safety precautions.

Never work on electrical equipment unless there is another person nearby who is familiar with operation and hazards of the equipment and who is competent in administering first aid. When technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, input power supply to the equipment must be shut off before beginning work. Take particular care to ground every capacitor likely to hold a dangerous potential charge. When working inside, after power has been turned off, always ground every part before touching it.

Be careful not to contact high voltage connections of 208 volts ac input when installing or operating this equipment.

Whenever nature of operation permits, keep one hand away from equipment to reduce hazard of current flowing through vital organs of body.

Do not operate equipment without all grilles, guards, louvers, and covers in place and tightly secured.

Warning: Do not be misled by term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

WARNING

When possible, disconnect input power to air conditioner before performing any maintenance to electrical system. Voltages used can be deadly. Shutting unit off at control panel does not disconnect power to various components of air conditioner.

WARNING

Allow heaters to cool before touching. Severe burns can result from touching hot heaters.

WARNING

Do not allow anyone under equipment suspended from a lifting device.

Do not allow unit to swing while suspended from a lifting device. Failure to observe warning may result in injury to personnel and damage to equipment.

WARNING

DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over.

WARNING

- Covers, grilles, and screens installed on unit are there for a purpose.
- Do not operate unit with them off or open unless instructions tell you to. When necessary, do so with care.

WARNING

Burning of polyurethane foams is dangerous.

Due to chemical composition of polyurethane foam, toxic fumes are released when burned or heated.

If it is burned or heated indoors, such as during a welding operation nearby, take care to ventilate area thoroughly. An exhaust system like that of a paint spray booth should be used.

Air-supplied respirators, approved by National Institute for Occupational Safety and Health Administration or United States Bureau of Mines, should be used for all welding in confined spaces and places where ventilation is inadequate. Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

WARNING

DANGEROUS CHEMiCAL
(Refrigerant 22)
is used in this equipment

DEATH
or serious injury may result if personnel fail to observe proper safety precautions. Great care must be exercised to prevent contact of liquid refrigerant, or refrigerant gas discharged under pressure, with any part of body. Extremely low temperature resulting from rapid expansion of liquid refrigerant, or refrigerant gas released under pressure, can cause sudden and irreversible tissue damage through freezing. All personnel must wear thermal protective gloves and a face shield or goggles when working in any situation where refrigerant contact with skin or eyes is possible. Application of excessive heat to any component in a charged system will cause extreme pressure that may result in a rupture, possibly explosive in nature. Exposure of Refrigerant 22 to an open flame or very hot surface will cause a chemical reaction in the gas to form carbonyl chloride (phosgene), a highly poisonous and corrosive gas. In its natural state, refrigerant 22 is a colorless, odorless vapor with no toxic characteristics. It is heavier than air and in a well ventilated area will disperse rapidly. However, in an unventilated area it presents danger as a suffocant.

WARNING

Be sure refrigeration system is fully discharged and purged and dry nitrogen is flowing through system at the rate of less than 1 - 2 cfm (0.028 - 0.057 m^3/minute) before all brazing or debrazing operations.

TECHNICAL MANUAL

TM5-4120-377-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 19 September 1983

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AIR CONDITIONER, VERTICAL, COMPACT, 18,000 BTU/HR 208 VOLT, 3 PHASE, 400 HERTZ

KECO MODEL F18T4-2S NSN 4120-01-127-0716

APPLIED MODEL 3788 NSN 4120-01-220-7391

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA form 2028 (Recommended Changes to Publications and blank forms) or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, Attention: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. A reply will be furnished to you.

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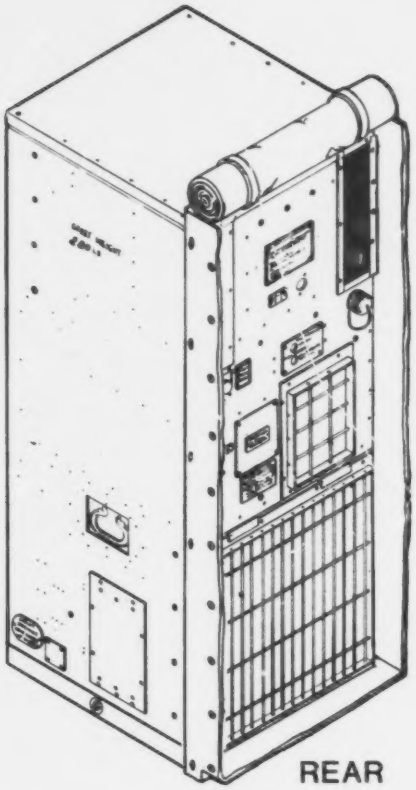

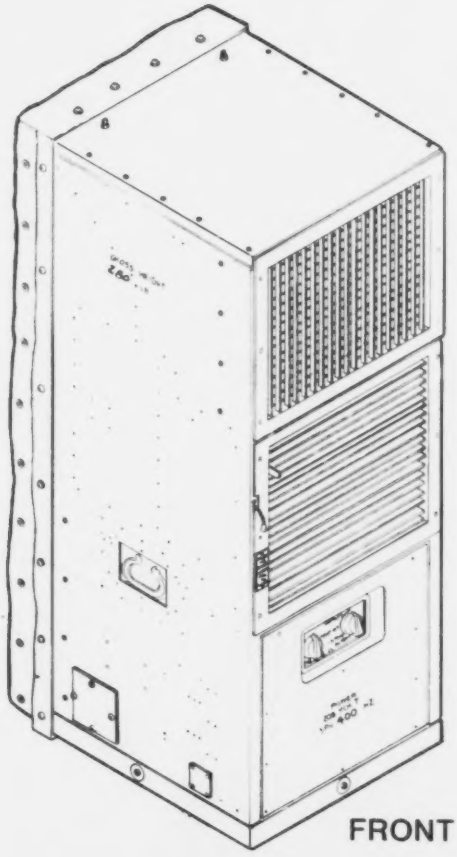

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Figure 1-1. Air Conditioner

CHAPTER 1
INTRODUCTION

Section I GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. Operator's, Organizational, Direct Support, and General Support Maintenance Manual.

b. Model Number and Equipment Name. Keco Model F18T4-2S and Applied Model 3788, Vertical, Compact, 18,000 BTU/HR, 208 Volt, 3 Phase, 400 Hertz Air Conditioner.

c. Purpose of Equipment. Cools, heats, and ventilates enclosed spaces. The unit covered by this manual is designed for cooling and heating air to a desired predetermined range and circulating the conditioned air to provide heating and cooling of equipment or personnel within the conditioned area.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1-3. HAND RECEIPT MANUAL

This manual has a companion document with a TM number followed by HR (which stands for Hand Receipt). The TM 5-4120-377-14HR consists of preprinted hand receipts (DA Form 2062) that list end item related equipment (i.e., COEI, BII, and AAL) you must account for. As an aid to property accountability, additional -HR manuals may be requisitioned from the following source in accordance with procedures in Chapter 3, AR 310-2:

The US Army Publications Center
2800 Eastern Blvd.
Baltimore, MD 21220-2896

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's)

If your Air Conditioner needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support Command, Attention: AMSTR-QX, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. We will send you a reply.

1-5. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Command decisions, according to tactical situation, will determine when destruction of the air conditioning unit will be accomplished. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

Contact organizational maintenance for air conditioning unit preparation for storage or shipment. (See para 4-67.)

Section II EQUIPMENT DESCRIPTION

1-7. PURPOSE, CAPABILITIES, AND FEATURES

a. Purpose of F18T4-2S and 3788 Air Conditioner. The Air Conditioners are designed to ventilate, cool or heat, and to filter air in rooms or enclosures.

b. Capabilities and features

(1) Provides a maximum of 18,000 BTU/HR of cooling or 12,000 BTU/HR of heating.

(2) Has two stages of heat.

(3) Provides source of filtered outside (fresh) ventilation air.

(4) Is self contained in a single cabinet that is ideally suited for van, shelter, or room installations.

(5) Operates in environmental conditions from tropic to arctic.

(6) Is fully portable.

(7) Has connection point for a CBR (chemical, biological, radiological) filter.

(8) Has alternate power input connection locations to provide for a variety of installations.

(9) Designed for low-noise level operation.

c. Special features

(1) The control panel may be removed from the unit and remote mounted.

NOTE

When control panel is remote mounted, a block off panel must be used on the air conditioner. The block off panel must be ordered separately. Interconnecting cables must also be fabricated. See installation instructions (para 4-7) for additional information.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

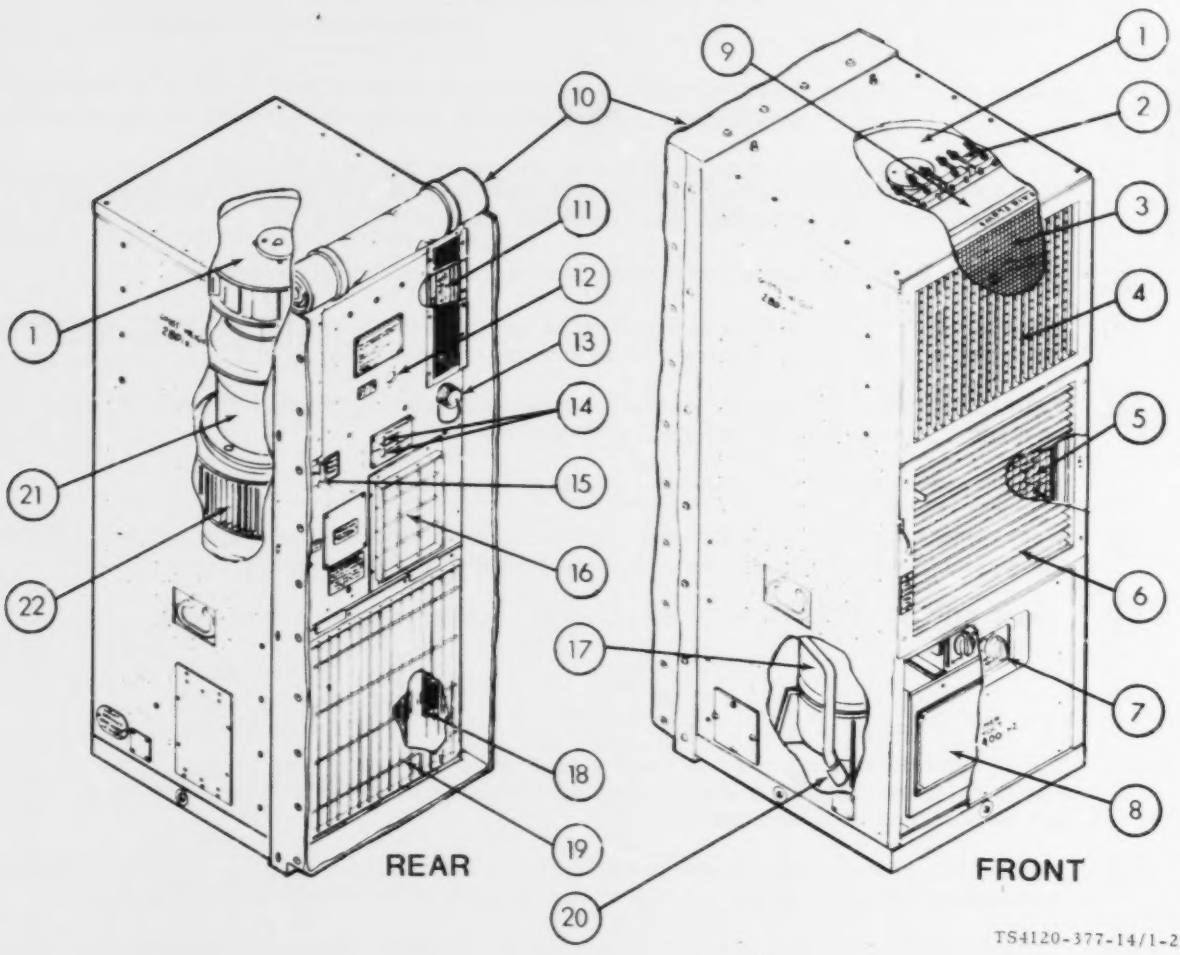


Figure 1-2. Location of Major Components

(1) CONDITIONED AIR (EVAPORATOR) FAN — Draws air into the evaporator section and exhausts it through the evaporator (cooling) coil and heater elements into the room or enclosure.

(2) HEATER ELEMENTS (HR 1 through HR 6) — Consists of two banks of three elements each. Only one bank operates in the LO HEAT mode. Both banks operate in the HI HEAT mode, however, the temperature control thermostat controls only one bank.

(3) MIST ELIMINATOR — Prevents condensate (water) from being blown from the coil into the room or enclosure.

(4) CONDITIONED AIR DISCHARGE GRILLE — Adjustable louvers allow directional control of conditioned air.

⑤ RETURN AIR FILTER — Provides filtered return air.

⑥ INTAKE (RETURN) AIR GRILLE — Adjustable louvers alllow control of outside (fresh) and return (from room or enclosure) air.

⑦ CONTROL PANEL — Contains a five position mode selector switch and a temperature control thermostat.

NOTE

The control panel is shown in its location when the air conditioner is installed as a self-contained unit. The control panel is designed so that it may be removed from the cabinet and installed in a remote location. See installation instructions (para 4-7).

⑧ JUNCTION BOX — Contains and protects electrical system control devices.

⑨ EVAPORATOR COIL — Serves as a heat exchanger by transferring heat from the air passing over the tubing and fins to the refrigerant passing through the tubing.

⑩ FABRIC COVER — Shown on rear view in stowed (operational) position. When rolled down and snapped it protects the rear (exposed) surface of the unit.

⑪ FRESH AIR FILTER AND DAMPER — Provides filtered outside air.

⑫ REFRIGERANT SIGHT GLASS (liquid sight indicator) — Allows visual inspection and indicates condition of liquid refrigerant when the unit is operating in the cool mode.

⑬ INPUT POWER RECEPTACLE — For connection of external power source cable.

NOTE

The air conditioner is designed so that the input power receptacle may be used in the front panel location shown, or it may be moved to one of four other alternative locations. See installation instructions (para 4-9).

⑭ HIGH AND LOW REFRIGERANT PRESSURE CUTOUT SWITCHES (S6 and S7) — Protects compressor from possible damage due to excessively high or low refrigerant pressures.

⑮ COMPRESSOR CIRCUIT BREAKER (CB1) RESET KNOB — Actuates a push-pull type control cable for resetting compressor circuit breaker.

⑯ CONDENSER AIR OUTLET GRILLE — Protects personnel from injury and fan from damage.

⑰ COMPRESSOR (B1) — Pumps refrigerant through the system during cooling operations.

⑱ CONDENSER COIL — Serves as a heat exchanger by transferring heat from the refrigerant passing through the tubing to the air passing over the tubing and fins.

⑲ CONDENSER COIL GUARD — Protects coil from damage.

⑳ CONDENSATE WATER DRIP PAN AND DRAIN TRAP — The drip pan is located directly below the evaporator coil and mist eliminator and is built into the casing. Its purpose is to collect condensate that drips off the evaporator coil and mist eliminator during cooling operations. Condensate water then flows through tubing to the drain traps located inside the lower right and left hand front corners of the cabinet. The drain traps contain check valves that prevent air flow between the condenser and evaporator sections through the drain tubing.

(21) FAN MOTOR (B2) — Drives both the conditioned air (evaporator) fan and the condenser fan.

(22) CONDENSER FAN — Draws air through the condenser coil and discharges the heated air back to the outside during cooling operations.

1-9. DIFFERENCES BETWEEN MODELS

The differences between Applied Model 3788 and Keco Model F18T4-2S require no alteration to operation or trouble shooting of the 208 volt, 400 hertz, 3 phase air conditioner.

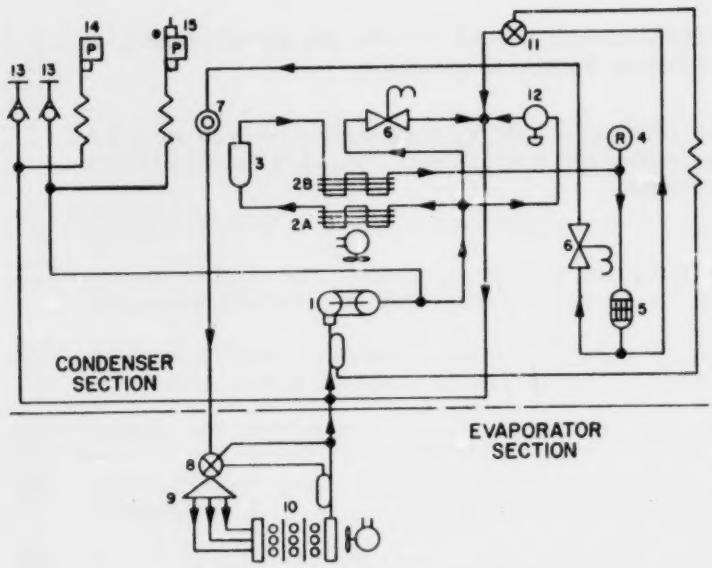
The design changes/improvements between Applied Model 3788 and Keco Model F18TH-2S are to the compressor, solenoid valves and rerouting of specified tubing and fittings. Refer to TM5-4120-377-24P, Change 1 for part number and configuration changes.

1-10. PERFORMANCE DATA

OPERATING TEMPERATURES	
LOW	-50°F (-45°C)
HIGH	+125°F (+51.6°C)
PERFORMANCE	
COOLING CAPACITY	18,000 Btu/hr
HEATING CAPACITY	12,000 Btu/hr
POWER REQUIRED	
VOLTAGE	208
PHASE	3
HERTZ	400
AMPERAGE	24.4
DIMENSIONS	
WIDTH	17.25 in. (43.8 cm)
DEPTH	20.00 in. (50.8 cm)
HEIGHT	46.5 in. (118 cm)
WEIGHT	280 pounds (110.2 kg)
REFRIGERANT	
TYPE	R-22
CHARGE	4 pounds (1.8 kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-11. REFRIGERATION CYCLE



COMPONENT REFERENCE LIST		
FIND NO.	QTY	DESCRIPTION
1	1	COMPRESSOR
2A	1	CONDENSER COIL
2B	1	SUBCOOLER (P/O FIND NO. 2A)
3	1	RECEIVER
4	1	PRESSURE RELIEF VALVE
5	1	DEHYDRATOR
6	2	SOLENOID VALVE
7	1	SIGHT GLASS
8	1	EXPANSION VALVE (PRIMARY)
9	1	DISTRIBUTOR
10	1	EVAPORATOR COIL
11	1	EXPANSION VALVE (QUENCH)
12	1	PRESSURE REGULATING VALVE
13	2	SERVICE VALVE
14	1	PRESSURE SWITCH (LOW)
15	1	PRESSURE SWITCH (HIGH)

Figure 1-3. Refrigeration Schematic

a. Cooling cycle. Unit operation with mode selector switch set on COOL and the temperature control thermostat set to DECREASE.

- Compressor (1) starts.

- To prevent compressor overload and damage during startup, equalizer solenoid valve (6) is open at start of cooling cycle to equalize pressure on both sides of the compressor.

- The compressor (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the metal tubing to the condenser coil (2A and 2B) and receiver (3).

- The condenser fan draws outside ambient air over and through the condenser coil (2A and 2B). The high temperature, high pressure gas from the compressor (1) is cooled by the flow of air and is changed into a high pressure liquid.

- The dehydrator (filter drier) (5) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.

- The sight glass (liquid indicator) (7) indicates the presence of moisture and quantity of refrigerant in the system.

- The liquid line solenoid valve (6) is controlled by the temperature control thermostat on the control panel. This valve will shut off the flow of refrigerant to the evaporator section when the temperature in the conditioned area reaches the set point.

• The expansion valve (8) controls the amount of pressure of liquid refrigerant to the distributor (9) and evaporator coil (10). The expansion valve (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of a sensing bulb and "external equalizer line" the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (10).

• As the liquid refrigerant leaves the expansion valve (8) it passes thru a distributor (9) and enters the evaporator coil (10). As the liquid enters the coil at a reduced pressure, the reduction in pressure and the warmer air being forced across the tubes of the coil cause the refrigerant to boil and change to a gas (vapor). The evaporator fan circulates the warm air from the conditioned space over and through the evaporator coil. Refrigerant absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with the evaporator coil (10), the air is cooled.

• The refrigerant gas is then drawn back to the compressor (1) and the cycle is repeated.

b. Bypass cycle. This unit has a bypass cycle which allows cooling operation at low cooling loads without cycling the compressor (1) on and off. In bypass, the refrigerant is piped from the discharge (high side) to the suction (low side) of the compressor, bypassing the evaporator coil (10).

• When the temperature control thermostat on the control panel senses that cooling conditions have reached the set point, it closes the liquid line solenoid valve (6) to shut off refrigerant flow to the evaporator coil (10).

• As the compressor suction pressure starts to drop, the pressure regulating valve (12) opens to allow flow of hot gas from the compressor.

• The expansion valve (quench) (11) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor, the expansion valve (quench) (11) opens to allow liquid refrigerant to mix with the hot gas.

• The service valves (13) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.

• The pressure switch (low) (14), the pressure switch (high) (15), and the pressure relief valve (4) are provided to protect the unit from damage due to pressure extremes.

1-12. HEATING

a. HI HEAT mode. When the mode selector switch is set for HI HEAT the six heating elements, located behind the evaporator coil, are energized. These elements are protected from overheating by a thermal cutout switch. Three of the elements are thermostatically controlled by the temperature control thermostat, and remaining three are on all of the time.

b. LO HEAT mode. When the mode selector switch is set for LO HEAT, only the three thermostatically controlled heating elements are used.

CHAPTER 2

OPERATING INSTRUCTIONS

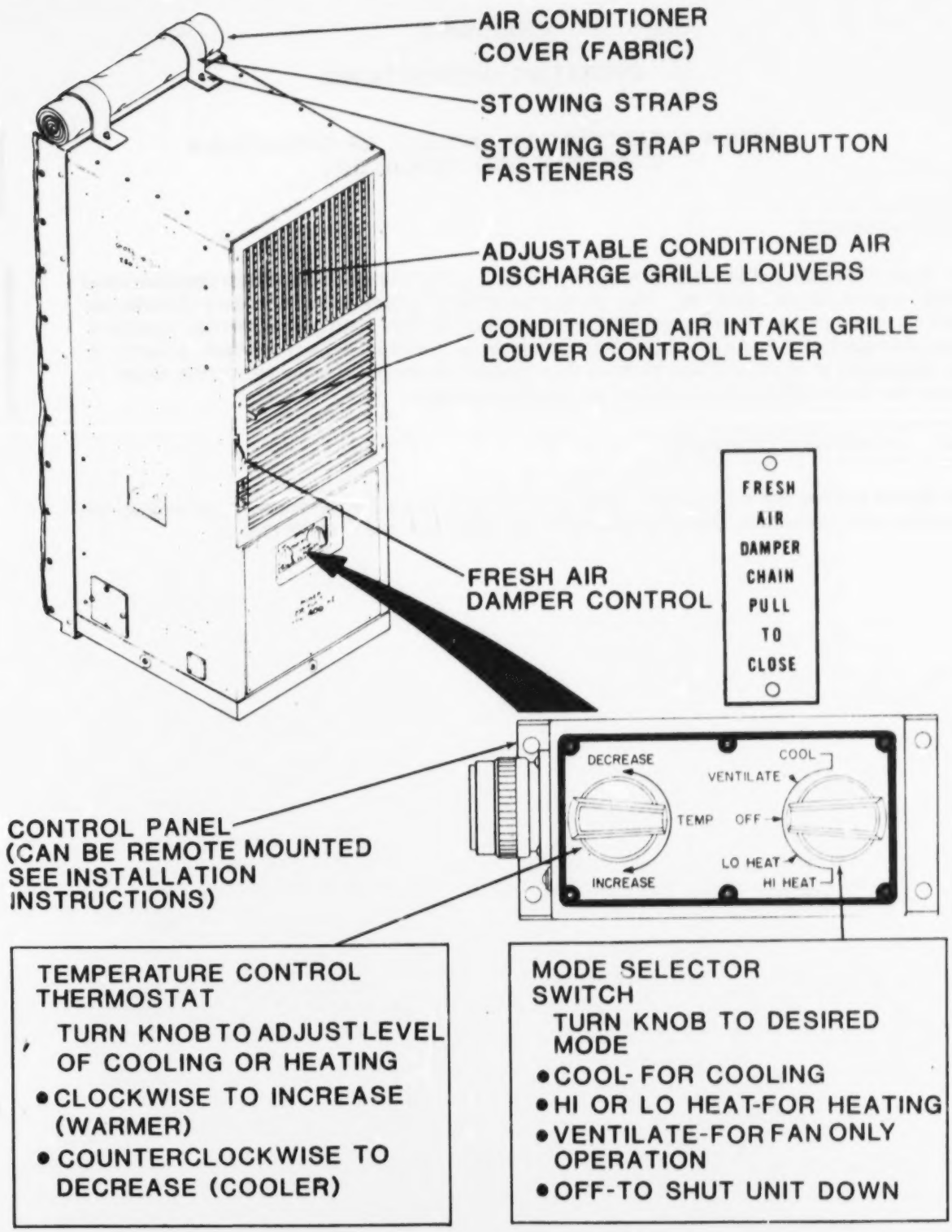
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

The Model F18T4-2S and Model 3788 are designed for a variety of installations and for operation under a wide range of climatic conditions. They are also designed for continuous or intermittent operation as a self-contained unit or may be connected to or used with external filtering equipment for operation under chemical-biological-radiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation. See the appropriate shelter or system manual for instructions peculiar to your specific installation.

2-2. OPERATOR'S CONTROLS

See figures 2-1 and 2-2 for a general description of the controls that an operator will normally be concerned with. For specific operating instructions, see Sections III and IV of this chapter.


AIR CONDITIONER COVER (FABRIC)
STOWING STRAPS
STOWING STRAP TURNBUTTON FASTENERS
ADJUSTABLE CONDITIONED AIR DISCHARGE GRILLE LOUVERS
CONDITIONED AIR INTAKE GRILLE LOUVER CONTROL LEVER
FRESH AIR DAMPER CONTROL
FRESH AIR DAMPER CHAIN PULL TO CLOSE
CONTROL PANEL (CAN BE REMOTE MOUNTED SEE INSTALLATION INSTRUCTIONS)
DECREASE
INCREASE
TEMP
COOL
VENTILATE
OFF
LO HEAT
HI HEAT
TEMPERATURE CONTROL THERMOSTAT
TURN KNOB TO ADJUST LEVEL OF COOLING OR HEATING
• CLOCKWISE TO INCREASE (WARMER)
• COUNTERCLOCKWISE TO DECREASE (COOLER)
MODE SELECTOR SWITCH
TURN KNOB TO DESIRED MODE
• COOL- FOR COOLING
• HI OR LO HEAT-FOR HEATING
• VENTILATE-FOR FAN ONLY OPERATION
• OFF-TO SHUT UNIT DOWN

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Figue 2-1. Operator's Controls Front

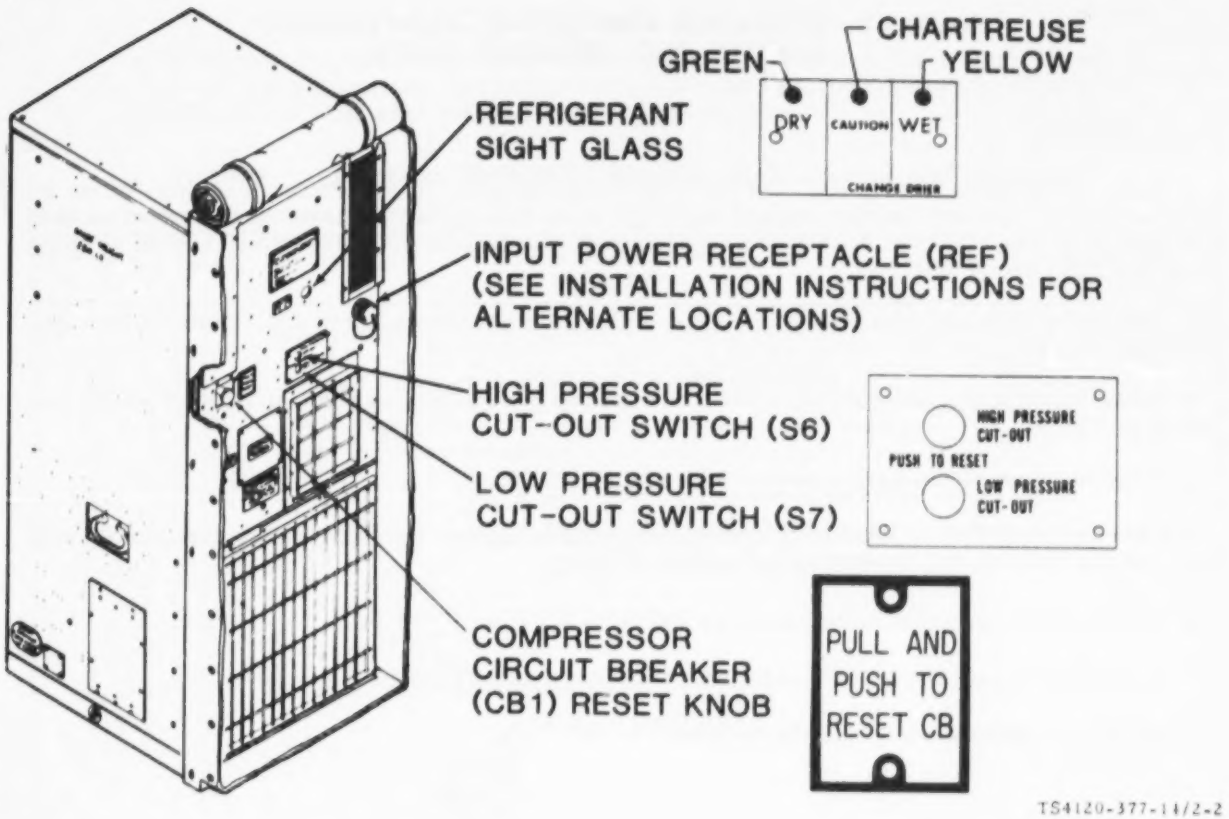


Figure 2-2. Operator's Controls Rear

2-3. INDICATORS

The refrigerant sight glass (fig. 2-2) is the only visual indicator used on the Model F18T4-2S and Model 3788 Air Conditioner. The sight glass is a port or window through which the refrigerant condition can be seen. Liquid refrigerant actually flows through the sight glass chamber only during cooling cycles when the air conditioner is in operation in the COOL mode. The unit must be operated approximately 15 minutes in maximum cooling prior to checking condition of refrigerant at sight glass. The sight glass is equipped with a center indicator that is moisture sensitive. Dry refrigerant is indicated by green, it turns to chartreuse when the moisture content becomes undesirable, and to yellow when the level becomes unacceptable. Excessive moisture in the refrigerant may damage or possibly destroy the compressor. If the liquid refrigerant observed in the sight glass has an opaque, milky appearance, or frequent bubbles appear, the volume of refrigerant is low and the system should be charged. Either moisture or low charge indications should be reported to direct support maintenance.

CAUTION

Do not operate the air conditioner in the COOL mode if the refrigerant color has reached the yellow band or if numerous bubbles appear in the sight glass. COOL mode operation may be continued with the refrigerant color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse.

Section II OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. GENERAL

Preventive Maintenance Checks and Services (PMCS) are essential to the efficient operation of the air conditioner and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to those functions which are described in table 2-1.

a. Before You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using DA form 2404. See DA PAM 738-750 (TAMMS) for instructions.

e. Perform weekly as well as before operations PMCS if:

(1) You are the assigned operator and have not operated the item since the last weekly.

(2) You are operating the item for the first time.

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

Table 2-1. Operator Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

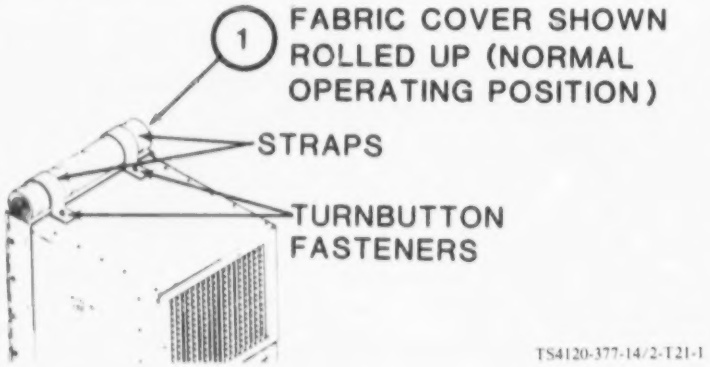
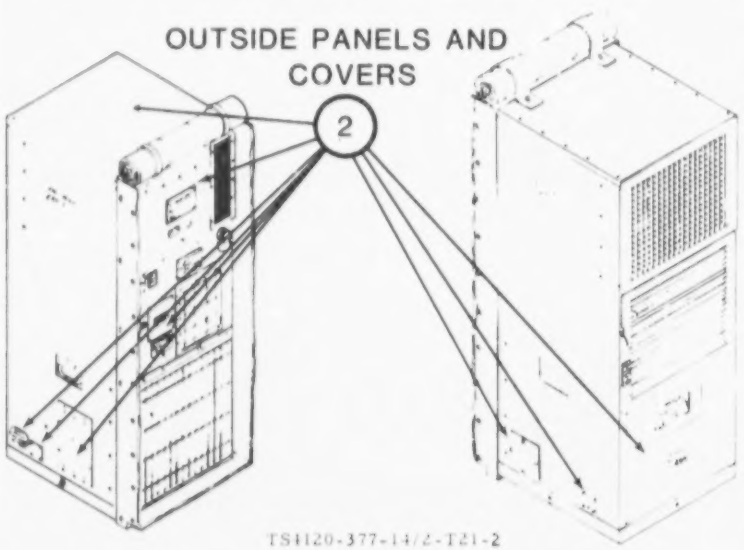
Item No.	B	D	A	W	M	Item To Be Inspected Procedure	Equipment Is Not Ready/Available If:
1						*Fabric Cover*	
	●					Check that cover is rolled up for normal operation.	
					●	Roll cover down and check for condition of snaps, tears or worn edges, and mildew.	
						 TS4120-377-14/2-T21-1	
2						*Outside Covers and Panels*	Panels missing or damage that would cause operating hazard.
	●					Check that panels are in place.	
						Check panels for cracks, dents, and missing hardware.	
						 TS4120-377-14/2-T21-2	

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont.)

B-Before D-During A-After W-Weekly M-Monthly

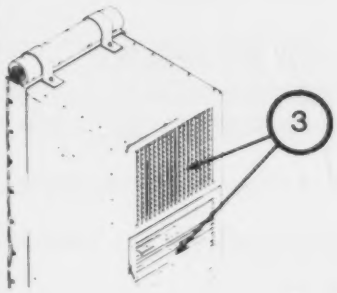
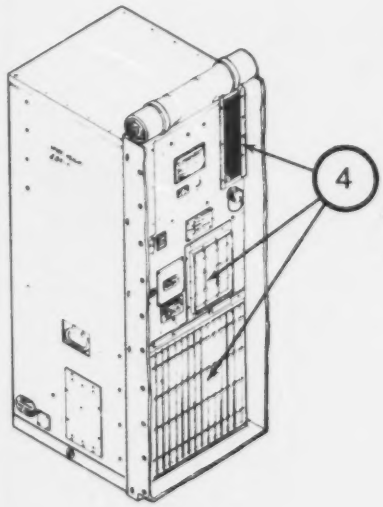
Item No.	B	D	A	W	M	Item To Be Inspected Procedure	Equipment Is Not Ready/Available If:
3						*Conditioned Air Grilles*	
	●					Check for obstructions, damage, proper adjustment, loose, or missing hardware.	
					●	Check louvers for freedom of operation.	
						Lubricate as required.	
						 TS4120-377-14/2-T21-3	
4						*Protective Grilles, Guards, and Screens*	
	●					Check that grilles, guards, and screens are in place.	Missing parts or damage that would cause operating hazards.
	●			●		Check them for obstructions, damage, and loose or missing hardware.	
						 TS4120-377-14/2-T21-4	

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont.)

B-Before D-During A-After W-Weekly M-Monthly

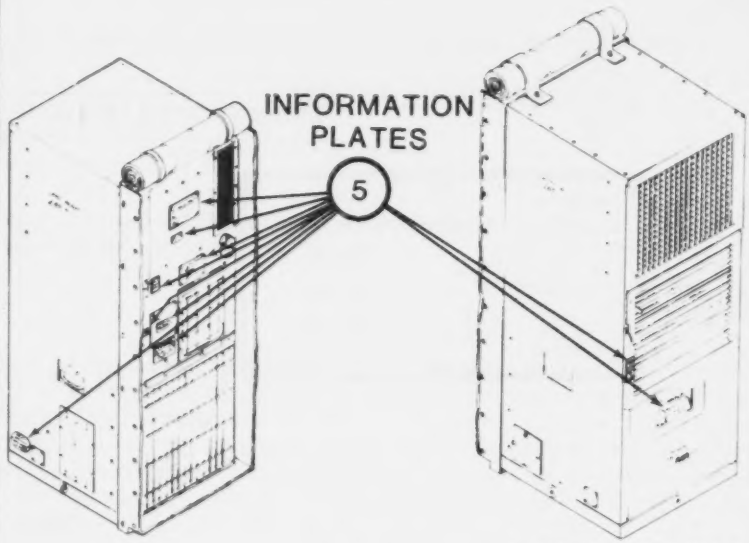
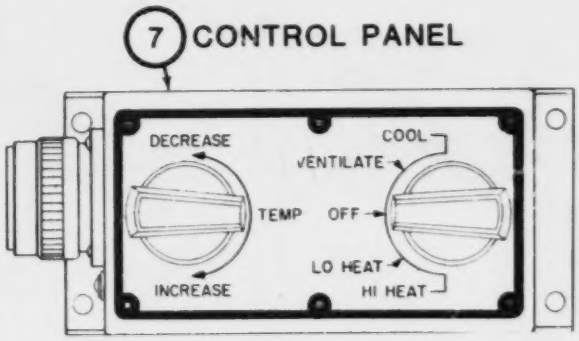
Item No.	B	D	A	W	M	Item To Be Inspected Procedure	Equipment Is Not Ready/Available If:
5						*Information Plates*	
	●					Check for legibility and loose or missing hardware.	
						 TS4120-377-14/2-T21-5	
6						*Fresh Air Damper*	
	●	●				Check for proper adjustment.	
			●			Check for freedom of operation.	Control chain broken, missing or inoperable.
						TS4120-377-14/2-T21-6	

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont.)

B-Before D-During A-After W-Weekly M-Monthly

Item No.	B	D	A	W	M	Item To Be Inspected Procedure	Equipment Is Not Ready/Available If:
7						*Control Panel*	
	●					Check for obvious damage and missing knobs.	Control panel damaged.
		●				Check for proper operation.	Unit not operating properly.
8						*Refrigerant Sight Glass*	
					●	After 15 minutes of operation in maximum cooling, check for bubbles or milky flow indicating low refrigerant charge. Check for yellow color which indicates presence of moisture.	Bubbles, milky flow, or yellow color is observed.



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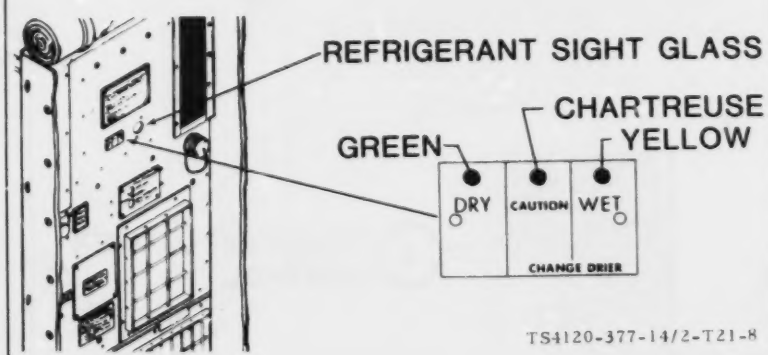

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Section III OPERATION UNDER USUAL CONDITIONS

2-5. ASSEMBLY AND PREPARATION FOR USE

Services of organizational maintenance should be employed for original unpacking, assembly installation, and preparation for use. See paragraphs 4-2 through 4-12.

2-6. INITIAL ADJUSTMENTS AND CHECKS

a. Inspect all covers, panels, grilles, and screens for loose mounting, obstructions, or shipping damage. Report any deficiencies to organizational maintenance.

b. Perform the preventive maintenance checks and services listed in table 2-1.

2-7. GENERAL OPERATING PROCEDURES

a. Before operation

(1) Check to see that power cable has been connected to a source of 208 volt, 3 phase, 4 wire, 400 hertz power, and to the input power connector on the unit.

CAUTION

Do not perform the operational check in COOL mode until input power has been supplied to the unit for at least four hours. Liquid refrigerant tends to migrate into the compressor crankcase and cylinders during periods when the compressor heater is not operating. Under moderate climatic conditions, the compressor heater will normally "boil" all liquid refrigerant out within a four hour period. If the air conditioner has been exposed to below freezing temperatures without input power, an eight hour warm up period is recommended.

(2) Check that fabric cover has been unsnapped, rolled up, and secured with both straps to the two turnbutton fasteners.

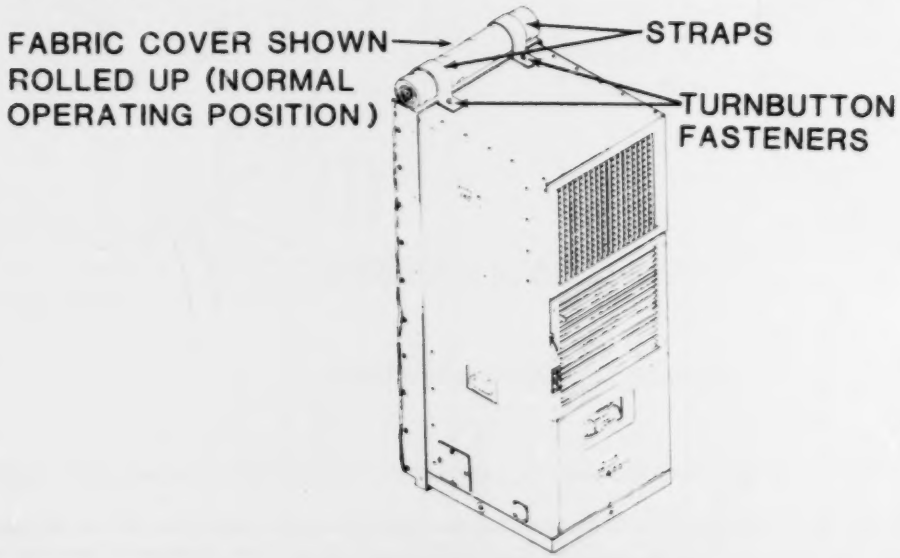


Figure 2-3. Fabric Cover

TS4120-377-14/2-3

CAUTION

Under normal operating conditions, before starting the air conditioner in any mode, make sure that the fabric condenser cover on the back of the condenser section is rolled up and secured and that all screens and guards are in place and unobstructed.

EXCEPTION:
Under extreme cold climatic conditions, such as blowing snow, or freezing rain which might enter and damage condenser section, the unit may be operated in the VENTILATE, LO HEAT, or HI HEAT modes with the fabric cover rolled down and snapped in place.

DO NOT OPERATE IN THE COOL MODE WITH THE FABRIC COVER ROLLED DOWN.

(3) Check that all air inlet and outlet openings are clear.

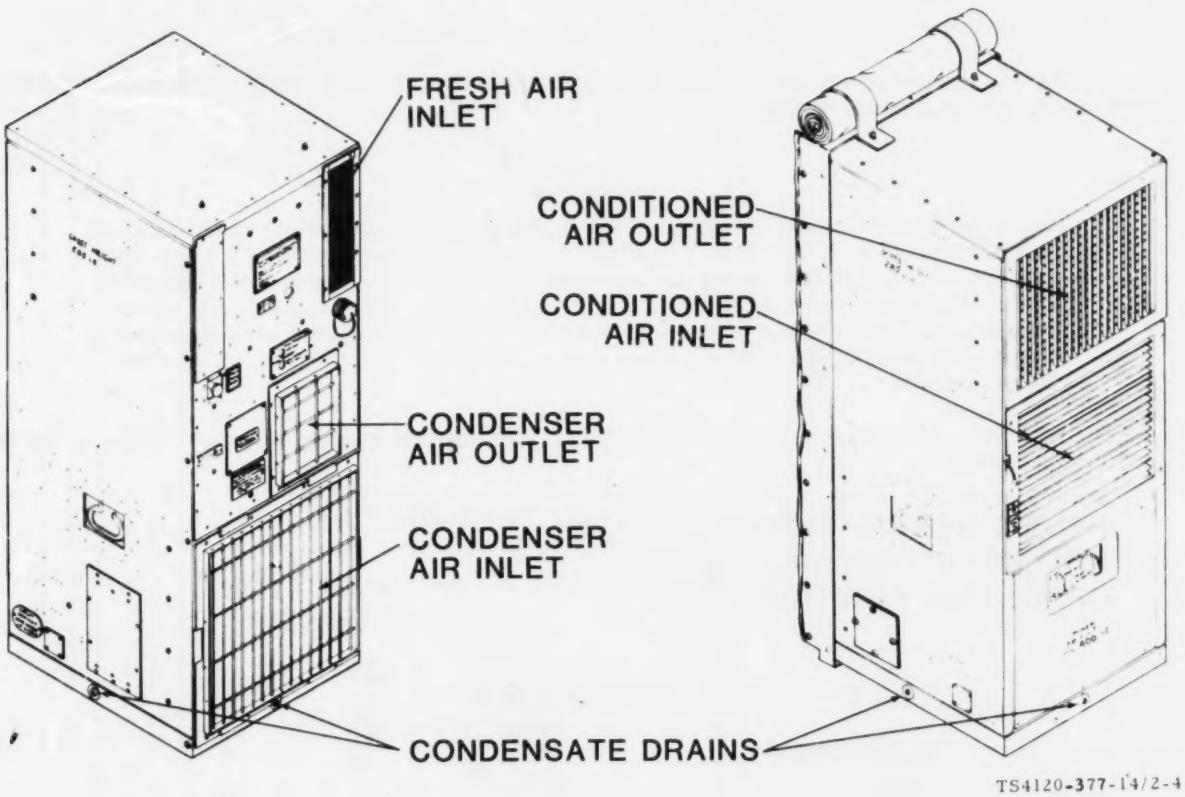


Figure 2-4. Air Openings and Drains

(4) Check that drains are either open or piped to a satisfactory location with a proper drain system.

(5) Table 2-2 lists the recommended control settings for the desired mode of operation. Minor adjustments may be made to get the desired mixture of recirculated and fresh air and the air flow patterns of conditioned air.

Table 2-2. Operator Control Settings

Mode	Mode Selector Switch	Temperature Control Thermostat	Fresh Air Damper	Conditioned Air Intake Grille	Conditioned Air Discharge Grille	Fabric Cover
Ventilate with 100% recirculated air	VENTILATE	Does not operate	Closed	Open	Adjust to suit	Rolled up or snapped closed
Ventilate with make-up (fresh air)	VENTILATE	Does not operate	Open	Open	Adjust to suit	Rolled up and secured
Ventilate with 100% fresh air	VENTILATE	Does not operate	Open	Closed	Adjust to suit	Rolled up and secured
Heating with 100% recirculated air	LO HEAT or HI HEAT	Desired temperature	Closed	Open	Slightly down for best results	Rolled up or snapped closed
Heating with make-up (fresh air)	LO HEAT or HI HEAT	Desired temperature	Open	Closed	Slightly down for best results	Rolled up and secured
Cooling with 100% recirculated air	COOL	Desired temperature	Closed	Open	Slightly up for best results	Rolled up and secured
Cooling with make-up (fresh air)	COOL	Desired temperature	Open	Open	Slightly up for best results	Rolled up and secured
Any mode with make-up air through CBR filter	Desired mode	Desired temperature	Closed and sealed	Partially closed	Adjust to suit	Rolled up and secured

b. General information (To increase comfort and save energy.)

(1) During *warm* or *cold* weather. (Air conditioner operation in COOL or HEAT modes.)

- Limit traffic through doors as much as possible.
- Keep doors and windows tightly closed.
- Limit use of fresh (outside) air.

NOTE

It is normally better to keep the fresh air damper slightly open. This will create a slight overpressure, provide replacement oxygen, and reduce room odors. Damper should be closed during extreme weather conditions and during periods when fast warm up or cooling is necessary.

Fresh air cannot be admitted if the fabric cover is rolled down.

- Do not adjust controls unnecessarily. Properly set the controls (See para 2-8 through 2-11.) and the unit will automatically control the temperature.
- The TEMPerature control thermostat on the control panel operates like a conventional room thermostat except that the temperature scale is not marked on the control panel. The thermostat has a control range of 40°F to 90°F (5°C to 32°C). The centered position of the control knob would be approximately 65°F (18°C). The full INCREASE would be 90°F (32°C). The full DECREASE would be 40°F (5°C).
- When the control panel is mounted in the unit the control temperature is sensed at the conditioned air inlet.
- When the control panel is mounted in a remote location (away from the unit) the temperature is sensed at that location.

(2) During *cold* weather

- Adjust shades, blinds, etc. (*when applicable*) to admit sunlight during day. Close them at night.
- Adjust the conditioned air outlet dampers slightly downward.

(3) During *hot* weather

- Adjust shades, blinds, etc. (*when applicable*) to block out sunlight during day.
- Adjust the conditioned air outlet dampers slightly upward.

2-8. OPERATION IN VENTILATE MODE (NO HEATING OR COOLING NEEDED)

a. Turn mode selector switch to VENTILATE.

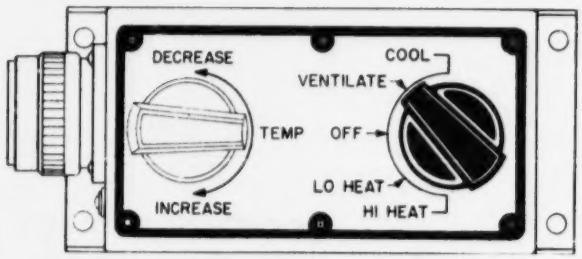


Figure 2-5. VENTILATE Control Setting

b. Adjust fresh air damper to desired setting. The unit can be operated in the VENTILATE mode with the fresh air damper (door) closed, open, or partially open.

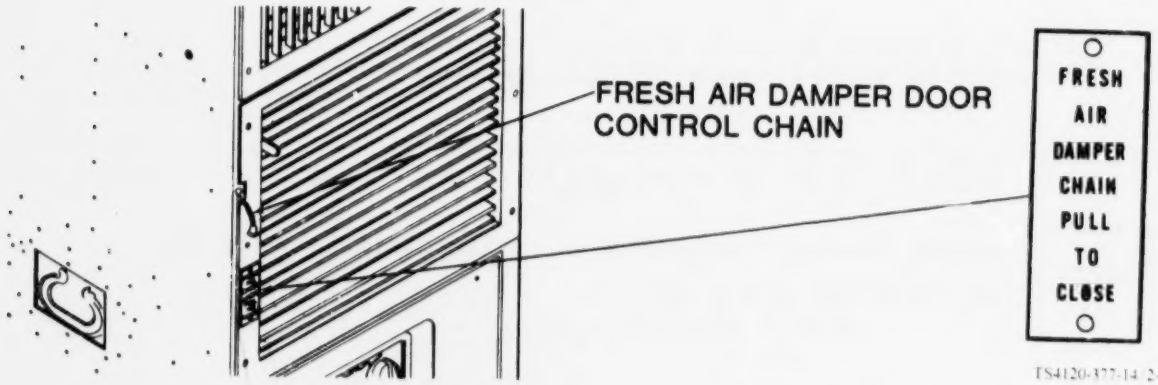


Figure 2-6. Fresh Air Damper (Door) Adjustment

NOTE

The fabric cover must be rolled up and secured if fresh air damper (door) is to be opened. When using fresh air for ventilation a window, door, or vent should be opened. If the room or enclosure is tightly closed, an overpressure will build up and decrease the volume of fresh air drawn in.

c. Adjust louvers to suit.

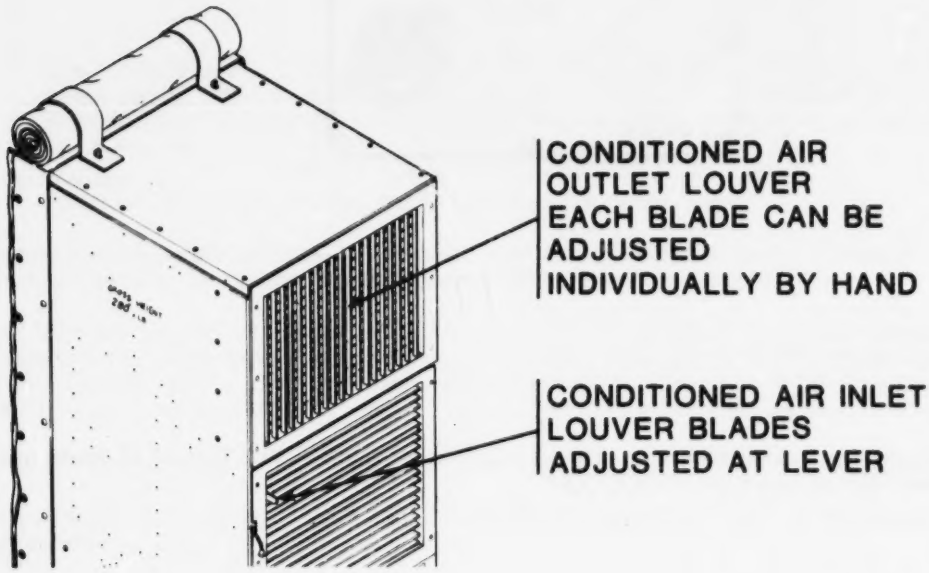

CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/2-7

Figure 2-7. Louver Adjustment

NOTE

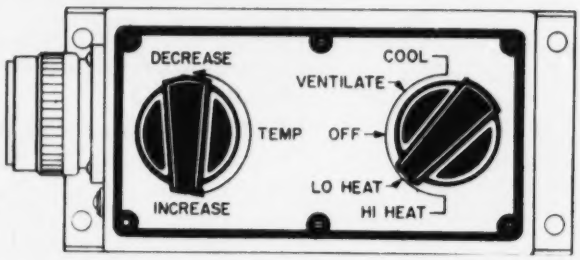
To pull in maximum of fresh (outside) air, close conditioned air inlet louvers.

2-9. OPERATION IN LO HEAT MODE

In the LO HEAT mode three thermostatically controlled heaters are activated.

a. Turn mode selector switch to LO HEAT.

b. Turn TEMPerature control thermostat knob as far as it will go in the INCREASE (warmer) position.



TS4120-377-14/2-8

Figure 2-8. LO HEAT Control Setting

NOTE

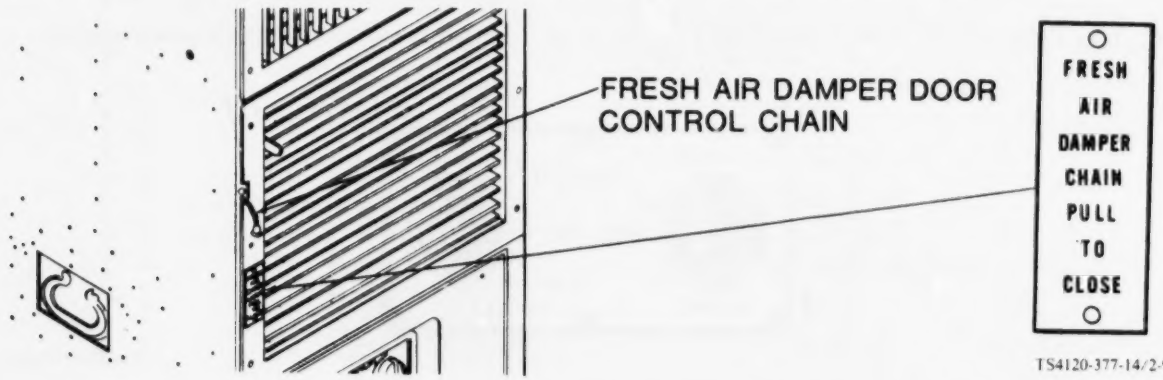
For faster warmup start unit in HI HEAT mode. In moderate temperatures, unit can then be switched back to LO HEAT.

c. When room or enclosure temperature reaches the desired level, *slowly* turn the TEMPerature control thermostat knob toward DECREASE. Heating will stop when you reach the approximate room temperature. Further adjustment can be made by turning the TEMPerature control thermostat knob *slightly* toward INCREASE (warmer) or DECREASE (cooler) until desired temperature is controlled automatically.

NOTE

Should unit fail to heat the room or enclosure to the desired temperature or fail to maintain the desired temperature with TEMPerature control thermostat set in maximum INCREASE position, switch to HI HEAT.

d. Adjust fresh air damper (door) to desired setting. It is normally better to keep the fresh air damper slightly open. Damper should be closed during very cold weather and during fast warmup periods.



TS4120-377-14/2-9

Figure 2-9. Fresh Air Damper (Door) Adjustment

e. Adjust louvers to suit. Since warm air tends to rise, it is normally better to adjust the conditioned air outlet louvers slightly downward. The conditioned air inlet louvers should be full open.

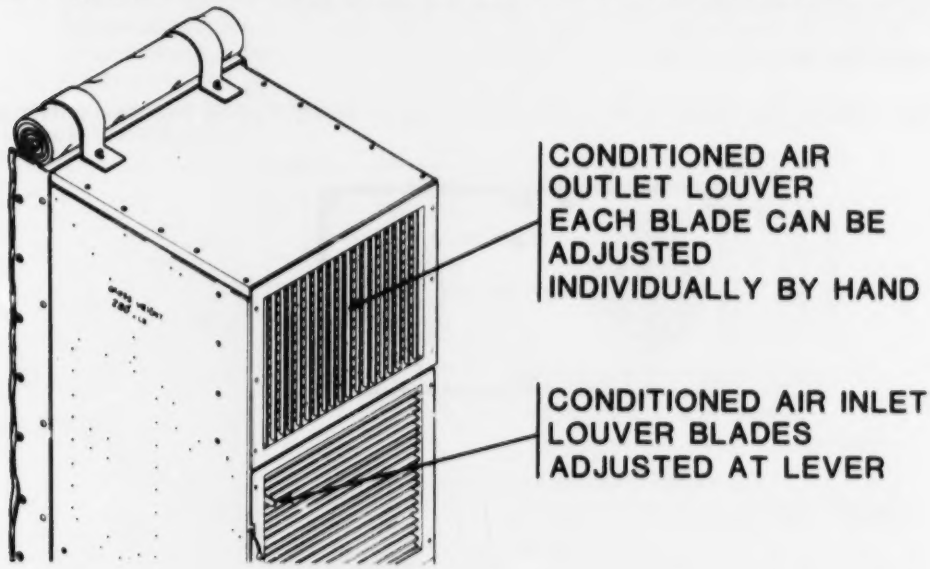

CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/2-10

Figure 2-10. Louver Adjustment

NOTE

An overheat thermostat located near the heating elements will turn them off if the temperature in the heater compartment reaches an excessive level.

2-10. OPERATION IN HI HEAT MODE

In the HI HEAT mode, six heaters are activated. Three are thermostatically controlled. Three operate all of the time.

a. Turn mode selector switch to HI HEAT.

b. Turn TEMPerature control thermostat knob as far as it will go in the INCREASE (warmer) position.

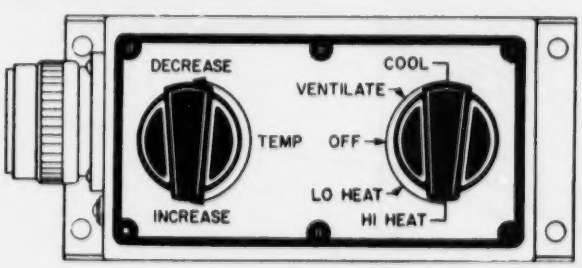


Figure 2-11. HI HEAT Control Setting

c. When room or enclosure temperature reaches the desired level, *slowly* turn the TEMPerature control thermostat knob toward DECREASE. Make small adjustments until desired temperature is maintained automatically.

NOTE

Should unit continue to produce too much heat with TEMPerature control thermostat knob adjusted toward the decrease setting, switch to LO HEAT.

d. Adjust fresh air damper (door) to desired setting. It is normally better to keep the fresh air damper slightly open. Damper should be closed during very cold weather and during fast warmup periods.

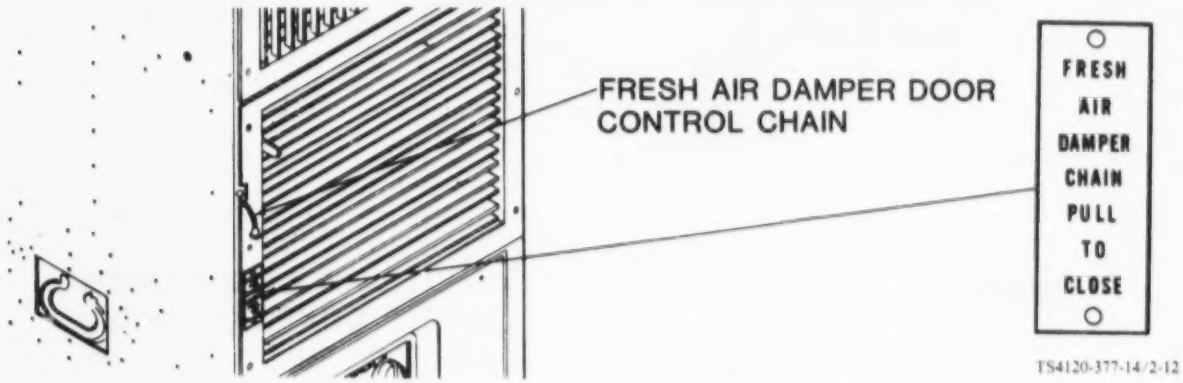


Figure 2-12. Fresh Air Damper (Door) Adjustment

e. Adjust louvers to suit. Since warm air tends to rise it is normally better to adjust the conditioned air outlet louvers slightly downward. The conditioned air inlet louvers should be full open.

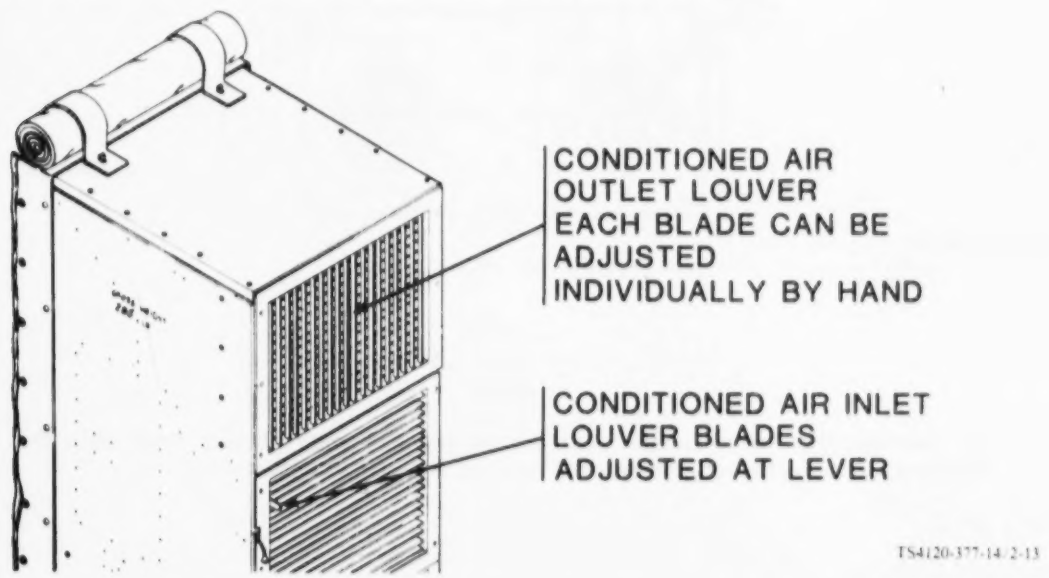

CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/2-13

Figure 2-13. Louver Adjustment

f. During periods of very cold weather the fabric cover should be rolled down and snapped.

NOTE

Fresh (outside) air cannot be introduced with fabric cover rolled down. Close damper.

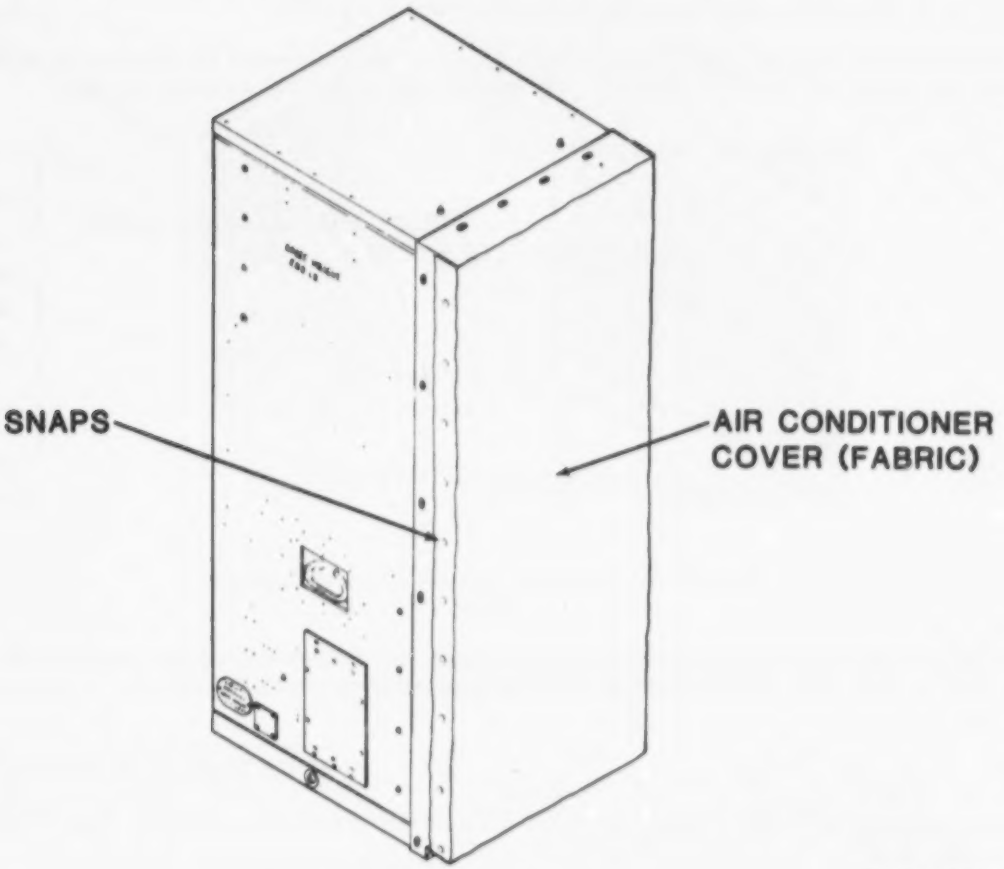


Figure 2-14. Fabric Cover

NOTE

An overheat thermostat located near the heating elements will turn them off if the temperature in the heater compartment reaches an excessive level.

2-11. OPERATION IN COOL MODE

a. Fabric cover *must be* rolled up and secured with turnbutton fasteners.

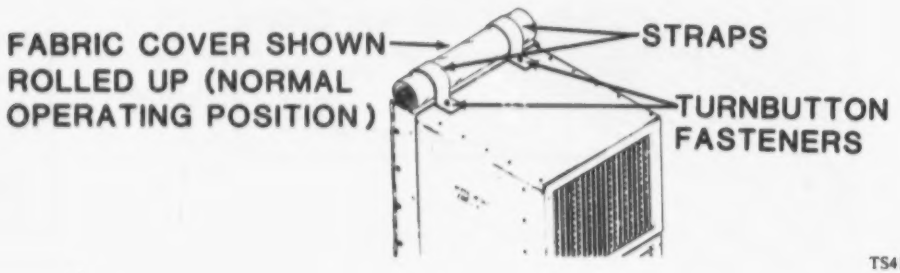


Figure 2-15. Fabric Cover

b. Turn mode selector switch to COOL.

c. Turn TEMPerature control thermostat knob as far as it will go in the DECREASE (cooler) position.

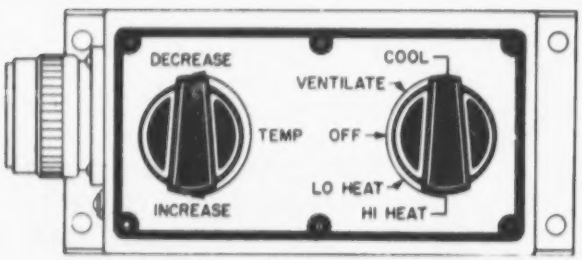


Figure 2-16. COOL Control Setting

d. For faster cool down at initial start-up fresh air damper (door) should be closed. After desired cooling temperature is reached, it is normally better to keep the fresh air damper (door) slightly open. During periods of very hot outside temperatures, it should be closed to improve efficiency and conserve energy.

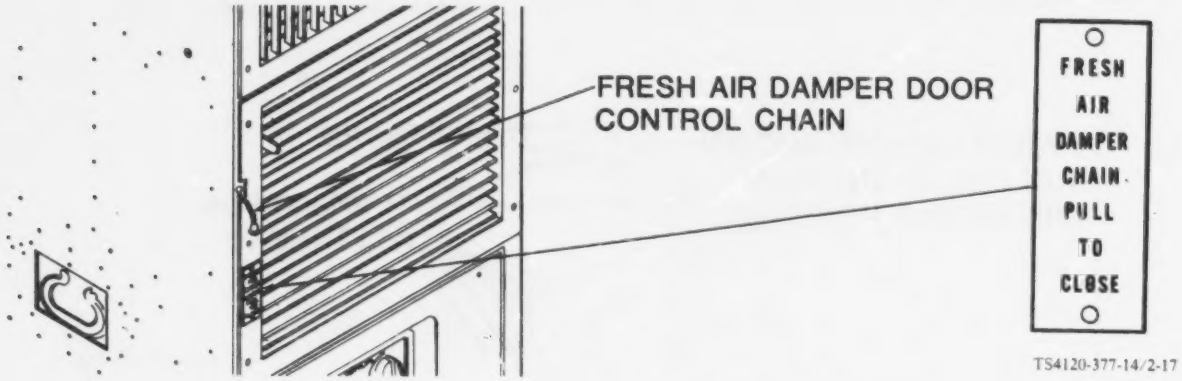


Figure 2-17. Fresh Air Damper (Door) Adjustment

e. When room or enclosure temperature reaches the desired level, *slowly* turn the TEMPerature control thermostat knob toward INCREASE. Cooling will stop when you reach the approximate room temperature. Further adjustment can be made by turning the TEMPerature control thermostat knob *slightly* toward DECREASE (cooler) or INCREASE (warmer) until desired temperature is controlled automatically.

f. Adjust louvers to suit. Since cold air tends to flow downward, it is normally better to adjust the conditioned air outlet louvers slightly upward. The conditioned air inlet louvers should be full open.

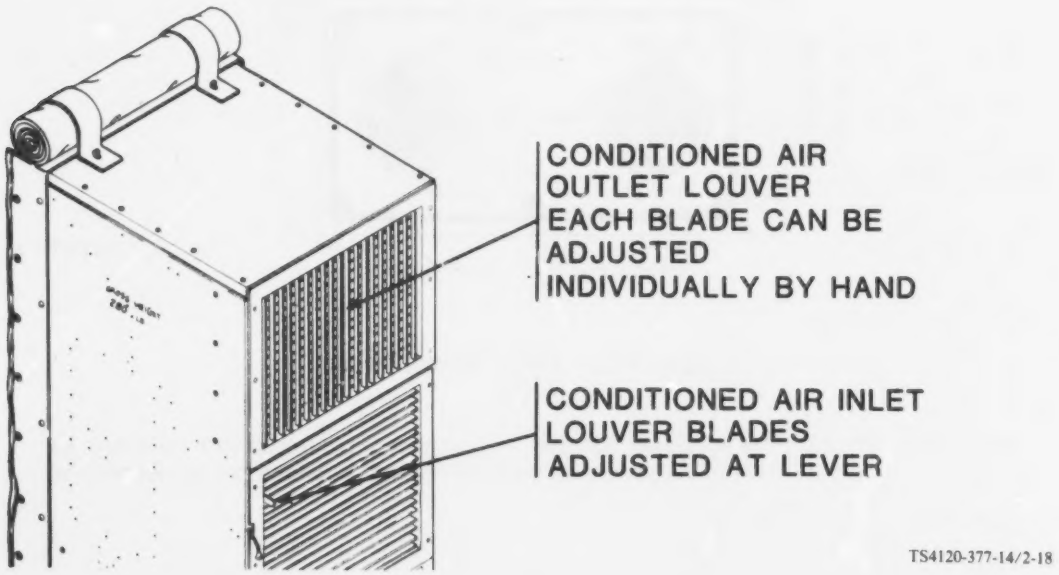
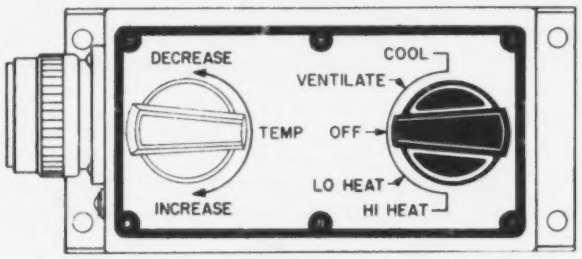

CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/2-18

Figure 2-18. Louver Adjustment

2-12. SHUTDOWN (OFF)

a. Turn the mode selector switch to OFF.



TS4120-377-14/2-19

Figure 2-19. OFF Setting

NOTE

DO NOT disconnect or turn off power to the air conditioner during periods of normal shutdown. Power should be disconnected only if unit is to be serviced, during emergency conditions, or during periods of extended shutdown, due to warm up period of compressor heaters.

2-13. PREPARATION FOR MOVEMENT

When the unit is to be moved, the services of organizational maintenance shall be employed for the necessary preparations. See Chapter 4, Section VII.

2-14. INFORMATION PLATES

A number of instruction and identification plates are provided with the unit. See figure 2-20 for external plates.

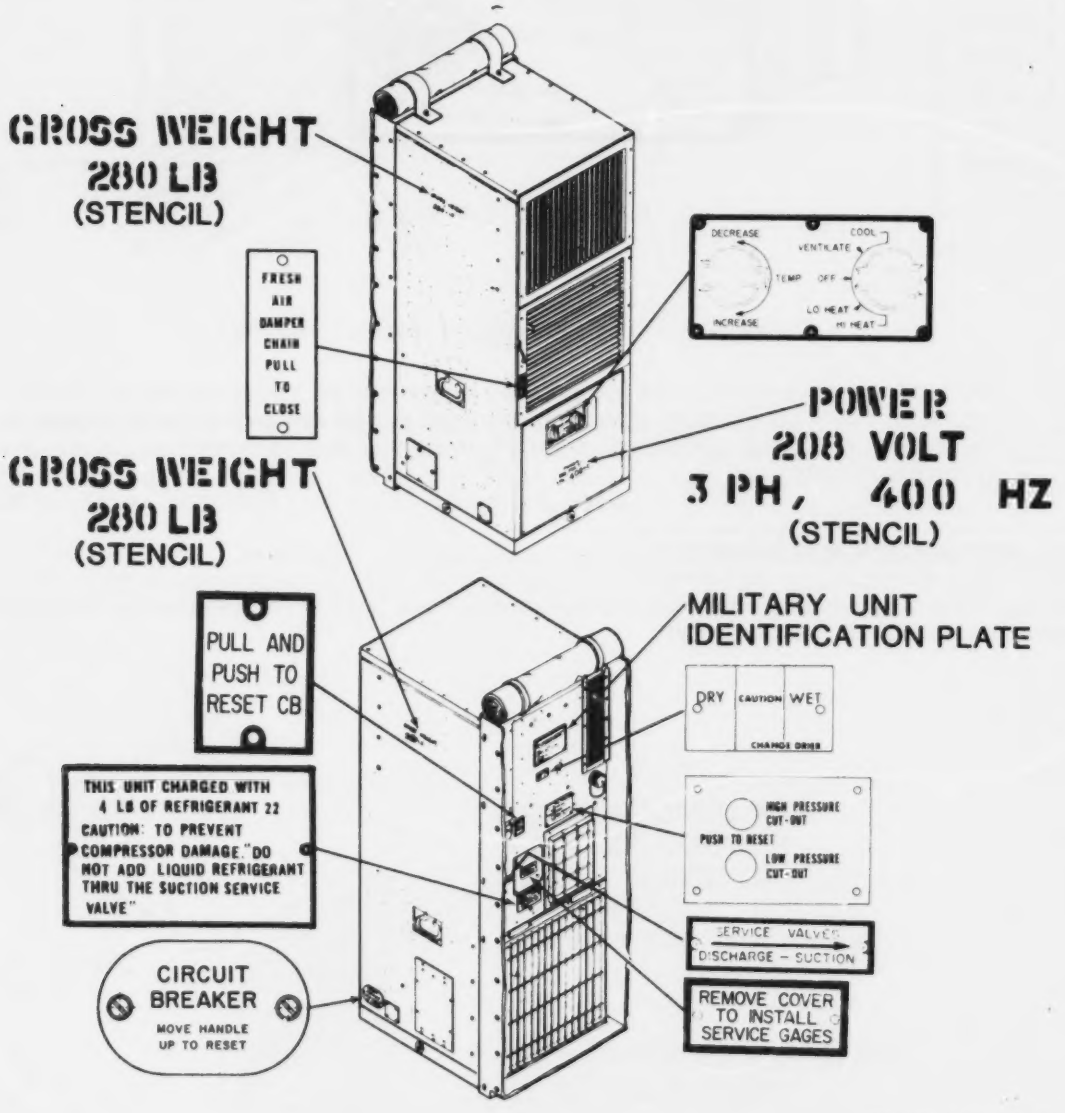


Figure 2-20. Information Plates

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-15. GENERAL

The Model F18T4-2S and Model 3788 Air Conditioners are designed to operate normally within a wide range of climatic conditions. However, some extreme conditions require special operating and servicing procedures to prevent undue loading and excessive wear on the equipment.

2-16. OPERATION IN EXTREME HEAT

The air conditioner is designed to operate in temperatures up to 125°F (51.6°C). Extra care should be taken to minimize the cooling load when operating in extremely high temperatures. Some of the steps that may be taken are:

a. Check all openings in the shelter or enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.

b. When possible, use shades or awnings to shut out direct rays of the sun.

c. Limit the use of electric lights and other heat producing equipment.

d. Limit the amount of hot, outside air introduced through the fresh air damper to that needed for ventilation.

NOTE

Weather stripping, the installation of storm doors and windows (if appropriate), and insulation of surfaces exposed to the outside is recommended when operating in extremely high temperatures for extended periods is anticipated.

2-17. OPERATION IN EXTREME COLD

CAUTION

Do not disturb electrical wiring that has been exposed to extremely low temperatures. Both the wire and insulation become brittle when cold and are easily broken.

The air conditioner is designed to operate in temperatures down to -50°F (-45°C). Extra care should be taken to minimize the heating load when operating in extremely low temperatures. Some of the steps that may be taken are:

a. Check all openings in the enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.

b. Open shades and awnings to permit entry of direct rays of the sun, if appropriate.

c. Limit the amount of cold, outside air introduced through the fresh air damper to that needed for ventilation.

NOTE

Weather stripping, the installation of storm doors and windows (if appropriate), and insulation of surfaces exposed to the outside is recommended when operation at extremely low temperatures for extended periods is anticipated.

2-18. OPERATION IN DUSTY OR SANDY CONDITIONS

Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filters and thereby causing a restriction of the volume of airflow. Accumulation of dust or sand in the condenser coil and/or in the compressor compartment may cause overheating of the refrigeration system. Dust or sand may also clog the mist eliminator, condensate trap, and water drain lines. Some of the steps that may be taken are:

a. Frequent cleaning of filters and all other areas of dust and sand accumulation. In extreme conditions, daily cleaning of filters may be necessary.

b. Limit the amount of dusty or sandy outside air introduced through the fresh air damper to that essential for ventilation.

c. Roll down and secure the fabric cover on the back of the cabinet during periods of shut-down.

2-19. OPERATION IN UNUSUALLY WET CONDITIONS

The air conditioner is designed for normal exposure to the elements, so it is reasonably waterproof. Some of the steps that should be taken in an extremely wet climate are:

a. More frequent inspection and cleaning of the mist eliminator, condensate trap, and drain lines to insure proper drainage and prevent accumulation of water inside the cabinet.

b. Roll down and secure the fabric cover on the back of the cabinet during periods of wet, windy weather when the air conditioner is not in operation.

c. Roll up and secure the fabric cover during dry spells when the air conditioner is not in operation so that the interior can dry out and condensation will not accumulate.

2-20. OPERATION IN SALT AIR OR SEA SPRAY

Salt air or sea spray may cause many of the same clogging problems as encountered when operating in a dusty or sandy environment. In addition, the nature of salt presents serious corrosion problems. Frequent cleaning is necessary during which all exposed surfaces should be thoroughly spray rinsed or sponged with fresh water to remove salt.

The fabric cover on the back of the cabinet should be rolled down and secured during all periods when the air conditioner is not in operation.

2-21. OPERATION UNDER EMERGENCY CONDITIONS

a. CBR (chemical, biological, radiological) hazard. This unit has provisions for connection to an external CBR filtering source. Should it be necessary to operate in conditions requiring use of CBR filtration equipment, see specific instructions for your shelter or facility installation.

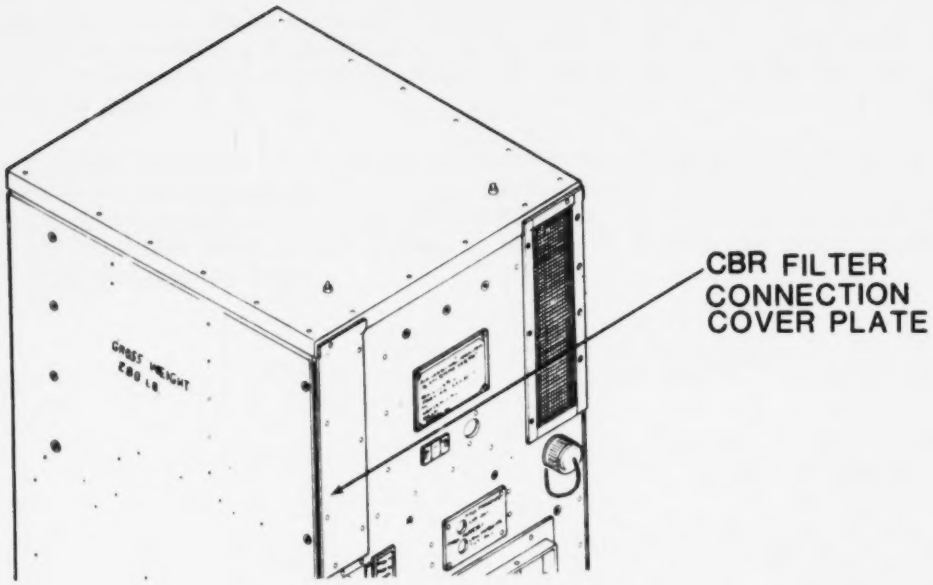


Figure 2-21. CBR Filter Connection Location

b. The following are general suggestions and do not apply if they conflict with instructions for your shelter or facility installation.

(1) The fresh air damper (door) should be closed, the opening should be covered with a suitable material, and sealed air tight.

(2) Fresh air damper (door) chain may be taped over to prevent damper from being opened.

(3) The conditioned air inlet louvers should be adjusted (partially or completely) closed in conjunction with the CBR filter intake volume. This will cause a more positive pressure on inside of shelter or enclosure and keep air from being drawn in other than through the CBR filter.

c. Power conservation. During periods when full 208 volt, 3 phase power is in critically short supply, if the air conditioner cannot be turned off completely, it should be operated in VENTILATE mode only.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL

The Model F18T4-2S and Applied Model 3788 Air Conditioner and their major components are designed so that very little lubrication is required during their serviceable lifetime. The refrigerant compressor and its drive motor are hermetically sealed in a single container; sealed bearings are incorporataed in the drive motor; and the compressor crankcase contains a lifetime charge of oil. Sealed bearings are incorporated in the evaporator and condenser fan motor.

The only operator lubrication required is that necessary to relieve stiffness or binding of the louver blades in the evaporator intake and discharge grilles or the turn button fasteners associated with thefabric cover on the back of the cabinet. Sparingly apply a light machine oil and work it into hte joints or pivots involved. Blot up all excess oil with a cloth or paper towel. Report stiffness or binding of all other operational controls to organizational maintenance for appropriate action.

Section II TROUBLESHOOTING PROCEDURES

3-2. USE OF TABLE

Table 3-1 contains troubleshooting instructions designed to be useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner.

a. The table lists the common malfunctions which you may find during the operation or maintenance of the air conditioner or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

c. Any trouble or corrective action beyond the scope of operator maintenance shall be reported to organizational maintenance.

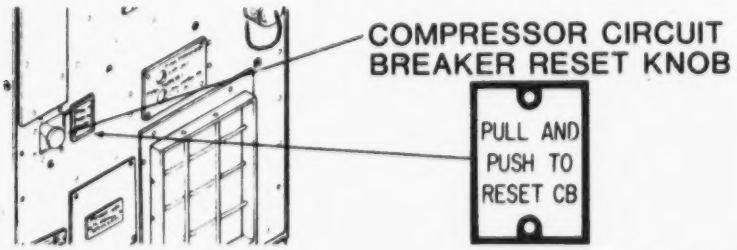
TABLE 3-1. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

Step 1. Check to see if input power has been disconnected.
Connect input power.

Step 2. Check to see if compressor circuit breaker is tripped.
Slowly PULL out AND PUSH in reset knob TO RESET CIRCUIT BREAKER.



TS4120-377-14/3-T31-1

NOTE

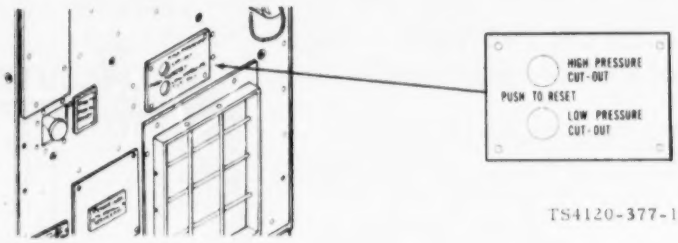
If circuit breakers continue to trip, contact organizational maintenance.

TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. COMPRESSOR DOES NOT START IN COOL MODE.

Step 1. Check to see if HIGH or LOW PRESSURE CUT-OUT switch has tripped. PUSH and release TO RESET.



TS4120-377-14/3-T31-2

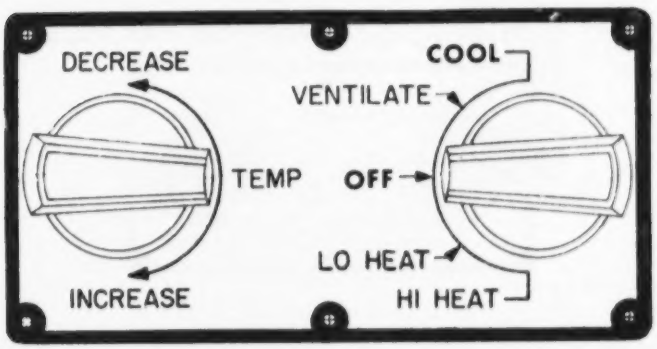
NOTE

If cut-out switch(s) continue to trip, contact organizational maintenance.

Step 2. Check operation of mode selector switch. Turn switch to OFF, then reset to COOL.

NOTE

Allow 30 seconds time delay before compressor starts.



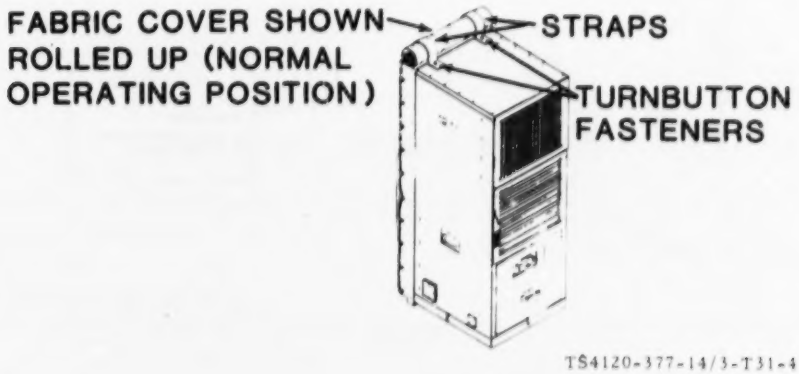
TS4120-377-14/3-T31-3

TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

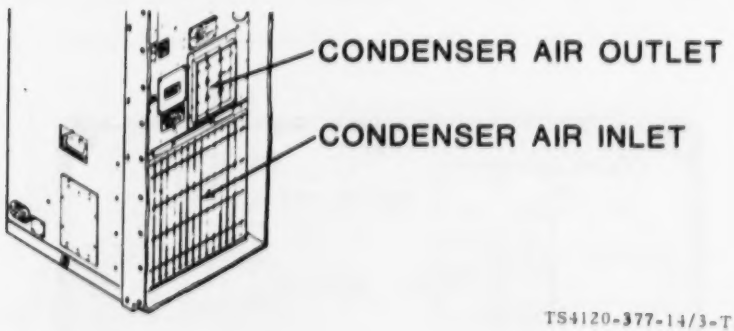
3. COMPRESSOR STARTS NORMALLY, BUT HIGH OR LOW PRESSURE CUT-OUT SWITCH SOON TRIPS.

Step 1. Check to be sure fabric cover is rolled up.
Roll up and secure fabric cover.



TS4120-377-14/3-T31-4

Step 2. Check to be sure condenser air inlet and outlet are not obstructed.
Remove obstructions.



TS4120-377-14/3-T31-5

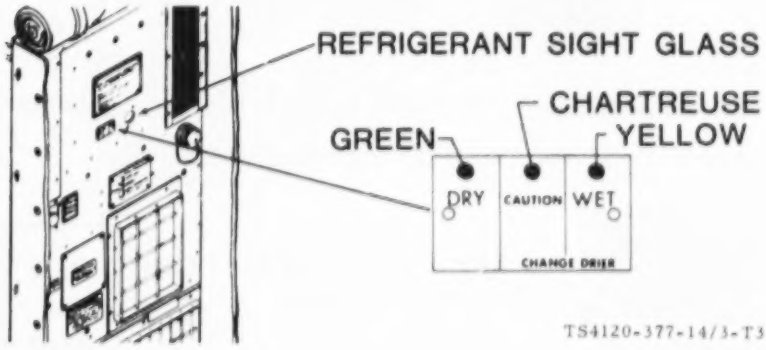
TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Reset (PUSH) PRESSURE CUT-OUT switch(s) and restart unit.
If unit does not start contact organizational maintenance.

Step 4. Check to be sure that condenser fan is operating. (Air being discharged from condenser air outlet.)
If fan is not operating, shut unit off and contact organizational maintenance.

Step 5. With unit operating in COOL mode, check condition of refrigerant in sight glass.
If indicator color is in the yellow zone or numerous bubbles appear in the window, turn selector switch to OFF and contact organizational maintenance.



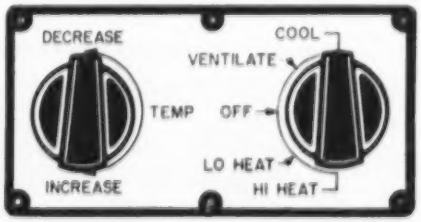
TS4120-377-14/3-T31-6

Step 6. Check to be sure that lower front panel is not loose or missing.
Lower front panel must be secure.

4. REDUCED COOLING CAPACITY.

Step 1. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.

Step 2. Check operation of TEMPerature control thermostat.
Set control at maximum DECREASE; then, if condition improves, adjust properly.

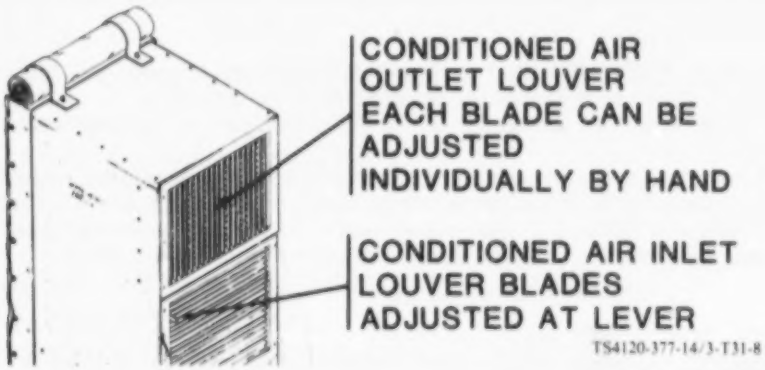


TS4120-377-14/3-T31-7

Step 3. Check that the louvers in the conditioned air inlet and outlet grilles are properly adjusted. (Must be open.)
Adjust louvers properly.

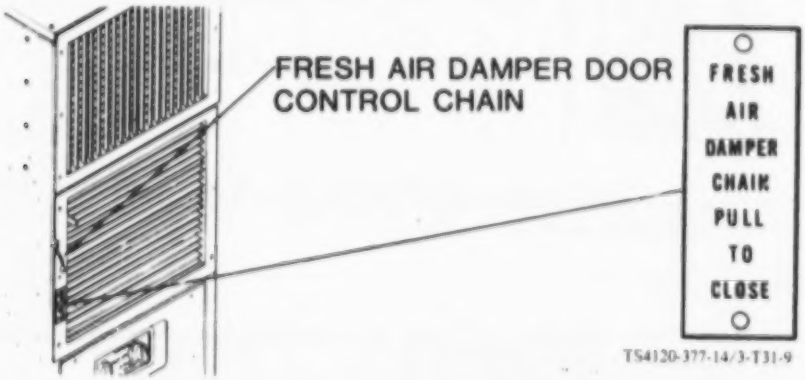
TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION


CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/3-T31-8

Step 4. Check to be sure that excessive hot, outside air is not being introduced through the fresh air damper.

Fully close damper; then, if condition improves, adjust properly.



Step 5. Check to be sure condenser air inlet and outlet are not obstructed.

Remove obstructions.

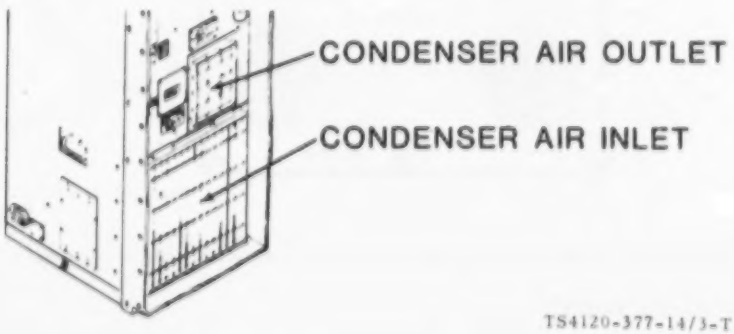
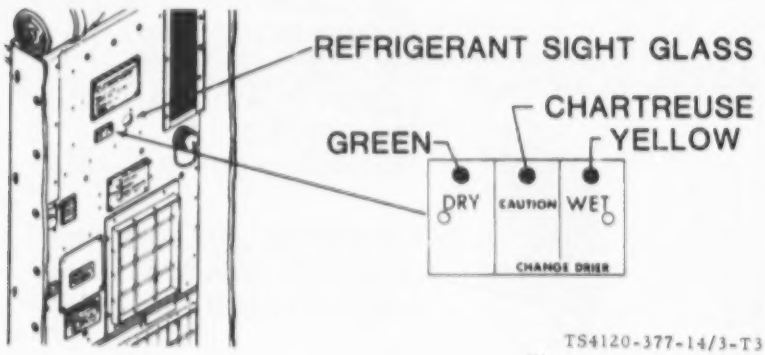


TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

Step 6. With unit operating in COOL mode, check condition of refrigerant in sight glass.
If indicator color is in the yellow zone or numerous bubbles appear in window, turn selector to OFF and contact organizational maintenance.



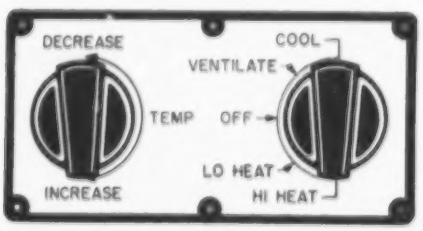
TS4120-377-14/3-T31-11

5. REDUCED HEATING CAPACITY.

Step 1. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.

Step 2. If control panel is remotely located, check to be sure that the sensing bulb is not near a light bulb or some type of heat producing equipment.
Turn off or move heat source.

Step 3. Check operation of TEMPerature control thermostat.
Set control to fully INCREASE; then, if condition improves, adjust properly.

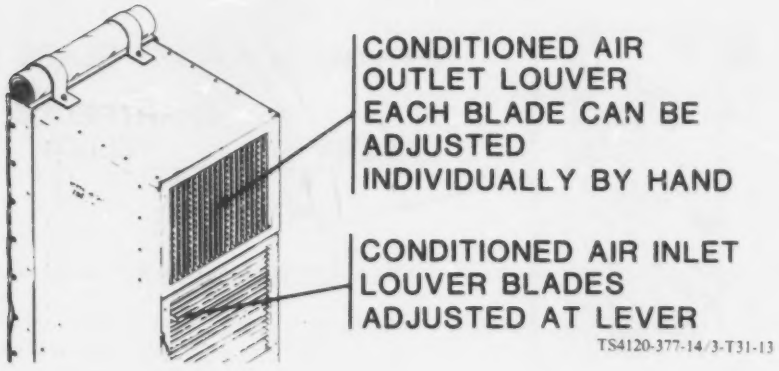


TS4120-377-14/3-T31-12

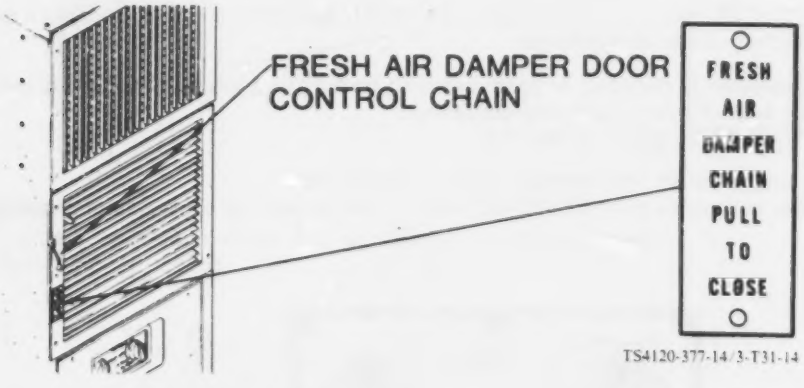
TABLE 3-1. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 4. Check that the louvers in the conditioned air inlet outlet grilles are properly adjusted.
Adjust louvers properly.


CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER
TS4120-377-14/3-T31-13

Step 5. Check to be sure that excessive cold, outside air is not being introduced through the fresh air damper.
Fully close damper; then, if condition improves, adjust properly.



CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL

a. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. Test, Maintenance, and Diagnostic Equipment (TMDE) and support equipment include standard equipment found in any organizational maintenance shop.

c. Repair parts and special tools are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 5-4120-377-24P, covering organizational, direct support, and general support maintenance for this equipment.

Section II SERVICE UPON RECEIPT

4-2. UNLOADING

The Model F18T4-2S and 3788 Air Conditioners are packaged in a container designed for shipment and handling with the cabinet in an upright position. The base of the container is constructed as a shipping pallet with provisions for the insertion of the tongs of a fork on materials handling equipment.

a. Remove all blocking and tie downs that may have been used to secure the container to the carrier.

b. Use a forklift truck or other suitable material handling equipment to remove the unit from the carrier.

CAUTION

Use care in handling to avoid damage to air conditioner. If an overhead lifting device must be used, use appropriate sling so that weight of unit is borne by base of the shipping container.

WARNING

Do not allow unit to swing while suspended from a lifting device. Failure to observe warning may result in injury to personnel and damage to equipment.

4-3. UNPACKING

a. General. Normally, the packaged air conditioner should be moved into the immediate area in which it is to be installed before it is unpacked.

NOTE

The shipping container is of such a design that it may be retained for reuse for mobility purposes if frequent relocation of the air conditioner is anticipated.

b. Remove shipping container. Cut the metal bands that hold the top and sides of the container of the base. Lift the container vertically and remove it from the base and cabinet.

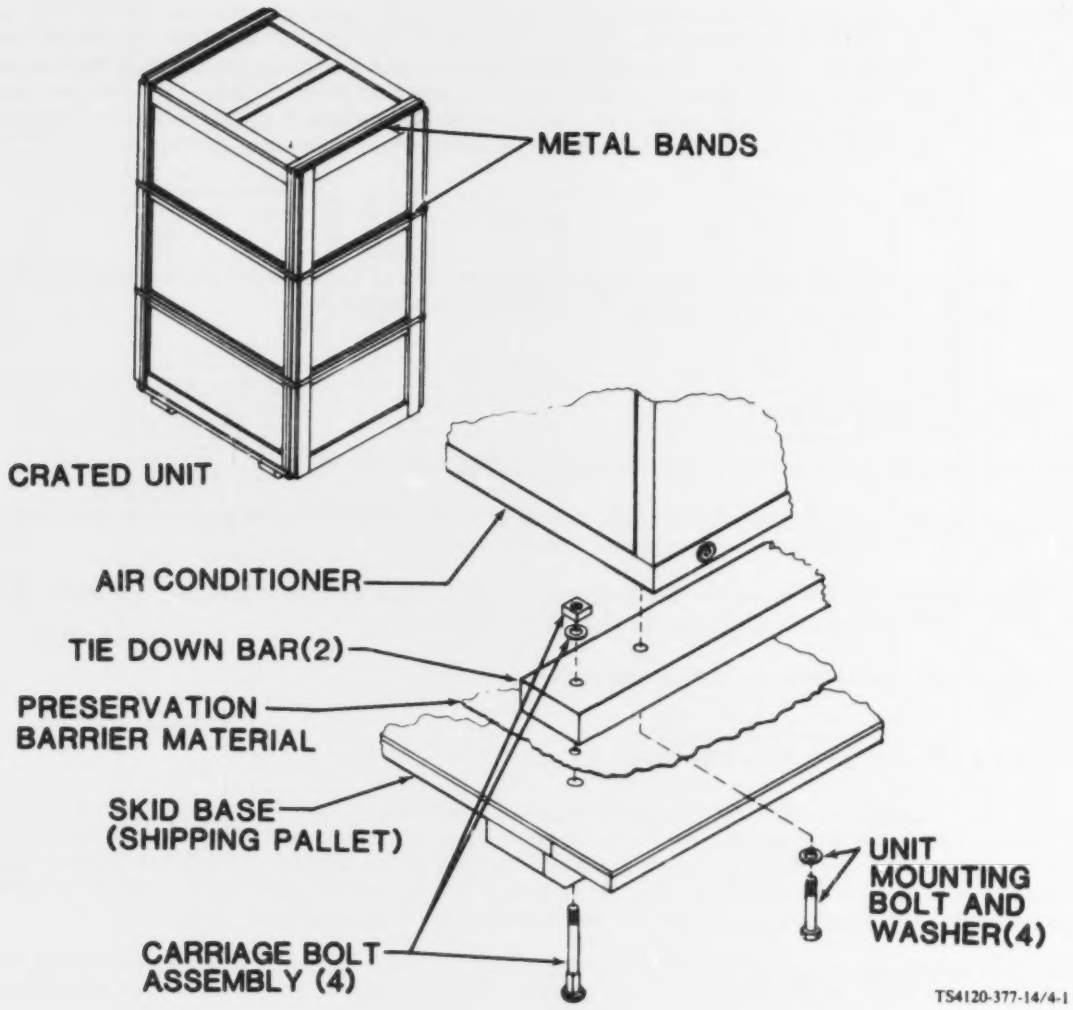


Figure 4-1. Unpacking

c. Remove packaging. Remove the cushioning around the top of the cabinet and retain, if reuse is anticipated. Remove the preservation barrier by tearing around the bottom of the cabinet. Remove the technical publications envelope and accessory sack that are taped to the cabinet and put them in a safe place.

NOTE

It is recommended that cabinet be left bolted to shipping pallet until time to place it in installation position. All receiving inspection actions can be conducted without removal from pallet.

WARNING

DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over.

d. Remove pallet. Attach an overhead hoist with an appropriate sling and spreader bar to the lifting handles provided at each side of the cabinet. Raise the cabinet and remove the four carriage bolt assemblies that hold the tiedown bars to the pallet from the underside of the pallet. Remove the four bolts that hold the two tiedown bars to the unit base. Remove and retain the pallet and carriage bolt assemblies and the tiedown bars and bolts, if reuse is anticipated. Be sure to remove all remaining barrier material from the underside of the cabinet base. Lower the cabinet to the floor in the desired position and remove the sling and hoist.

NOTE

Bolts used to anchor cabinet base to tiedown bars may be used to anchor it in place in installed location if installation method allows for anchoring from beneath.

4-4. RECEIVING INSPECTION

Perform receiving inspection of the air conditioner in the following manner:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on DD Form 6, Packaging Improvement Report.

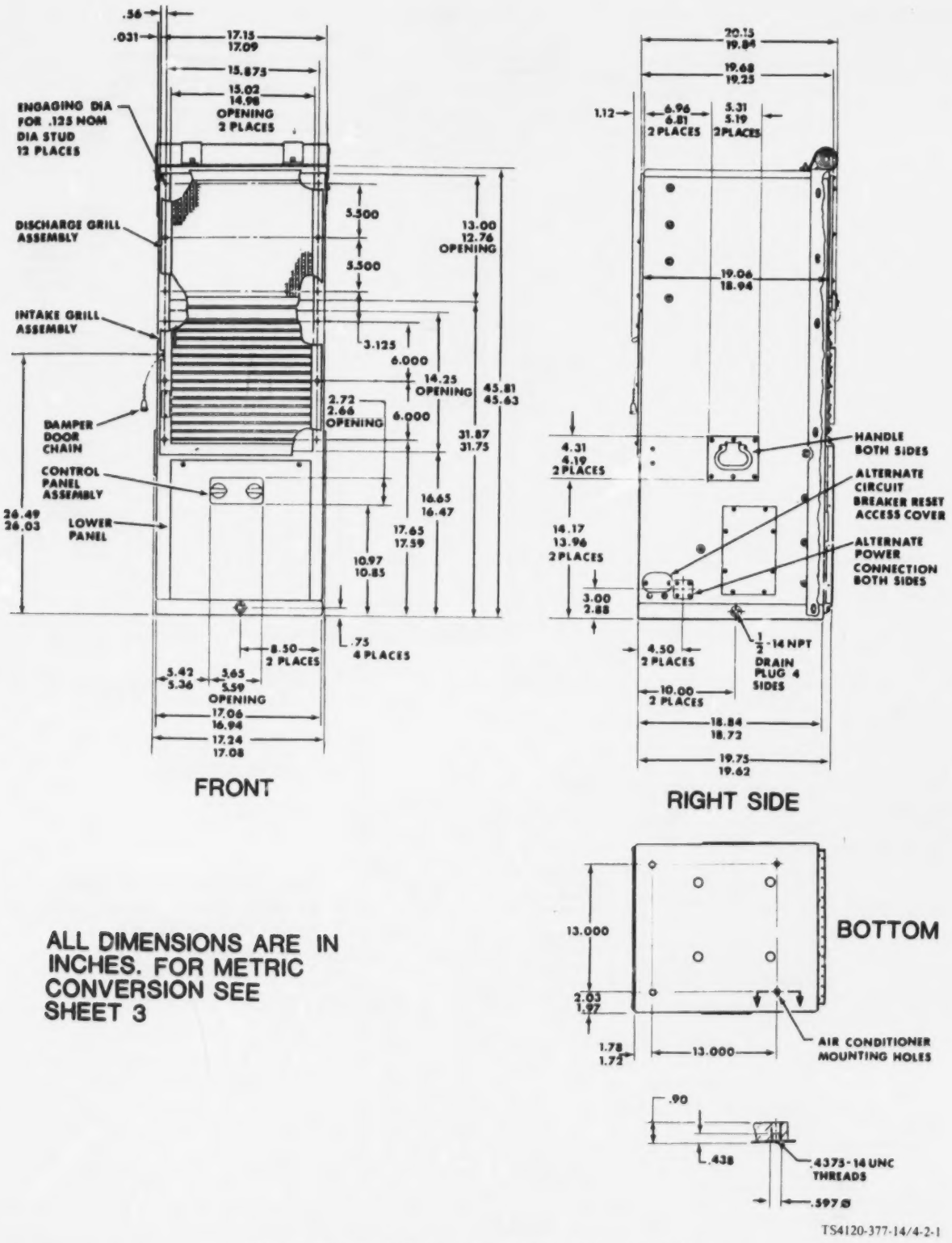
b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

4-5. INSTALLATION SITE PREPARATION

a. General. The air conditioner is designed so that it is adaptable to a variety of installation arrangements. Most typical installations are made by preparing an opening in an exterior wall of the room or enclosure to be conditioned and positioning the air conditioner so that the front of the cabinet is inside the room or enclosure and the back outside. Alternate installations may be made with the entire cabinet either inside or outside the conditioned area. The following are minimum requirements for all installations:

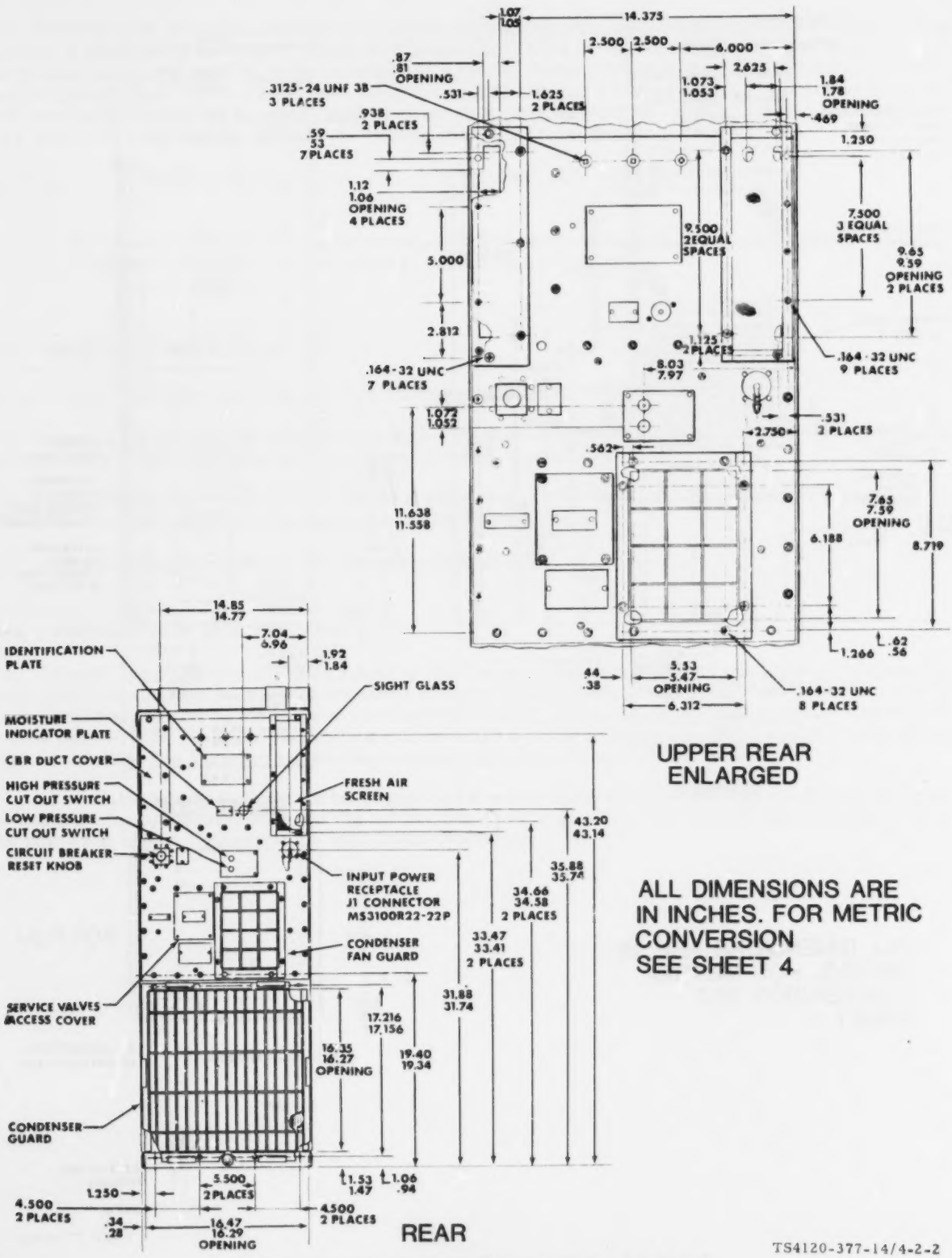
(1) A relatively level surface capable of bearing the weight of the air conditioner on which to set the base. To insure proper condensate drainage, the surface should be level with 5° from front to back and side to side. See figure 4-2, sheets 1 through 4, for installation dimensions.



ALL DIMENSIONS ARE IN INCHES. FOR METRIC CONVERSION SEE SHEET 3

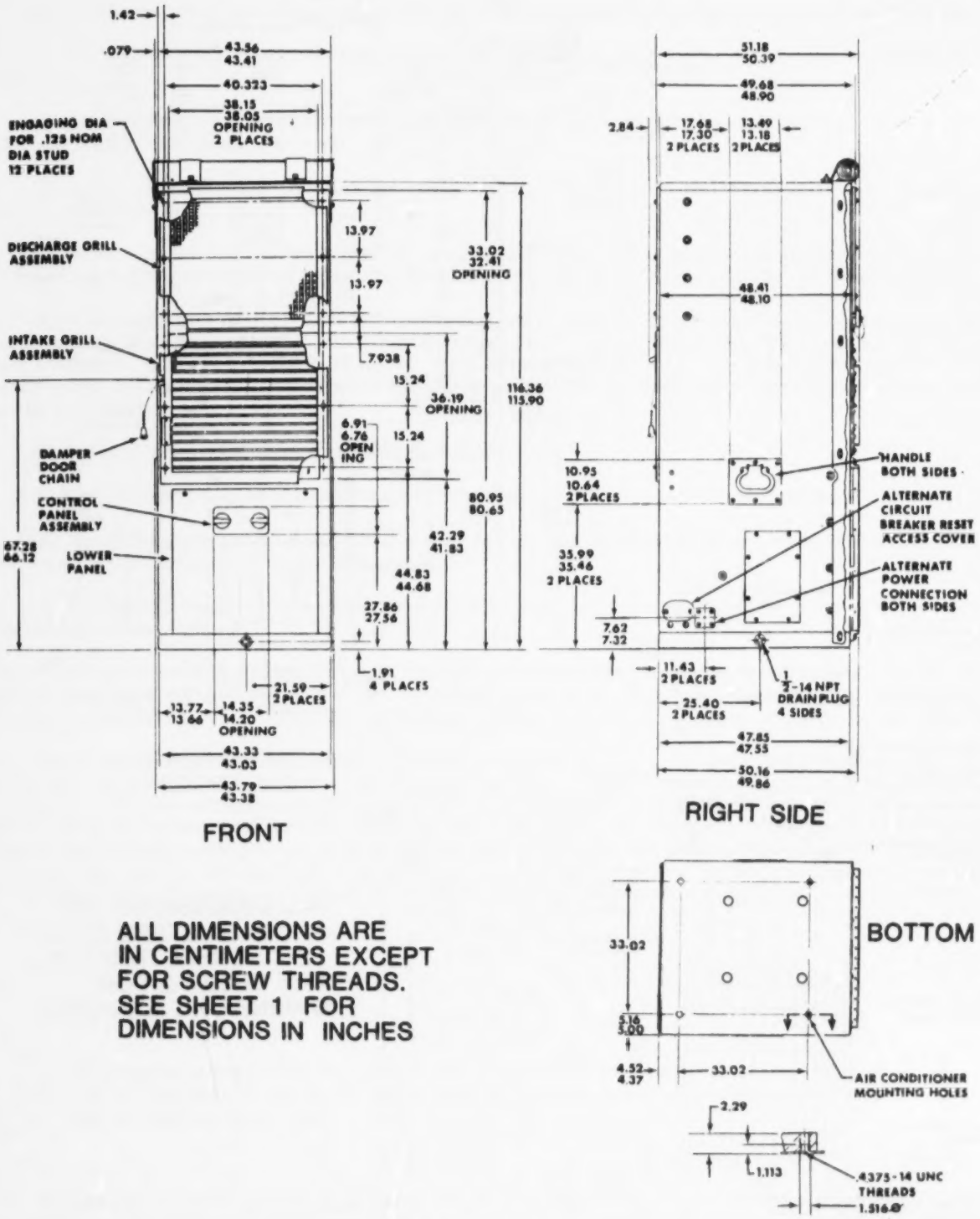
TS4120-377-14/4-2-1

Figure 4-2. Installation Dimensions (Sheet 1 of 4)



TS4120-377-14/4-2-2

Figure 4-2. Installation Dimensions (Sheet 2 of 4)



ALL DIMENSIONS ARE IN CENTIMETERS EXCEPT FOR SCREW THREADS. SEE SHEET 1 FOR DIMENSIONS IN INCHES

TS4120-377-14/4-2-3

Figure 4-2. Installation Dimensions (Sheet 3 of 4)

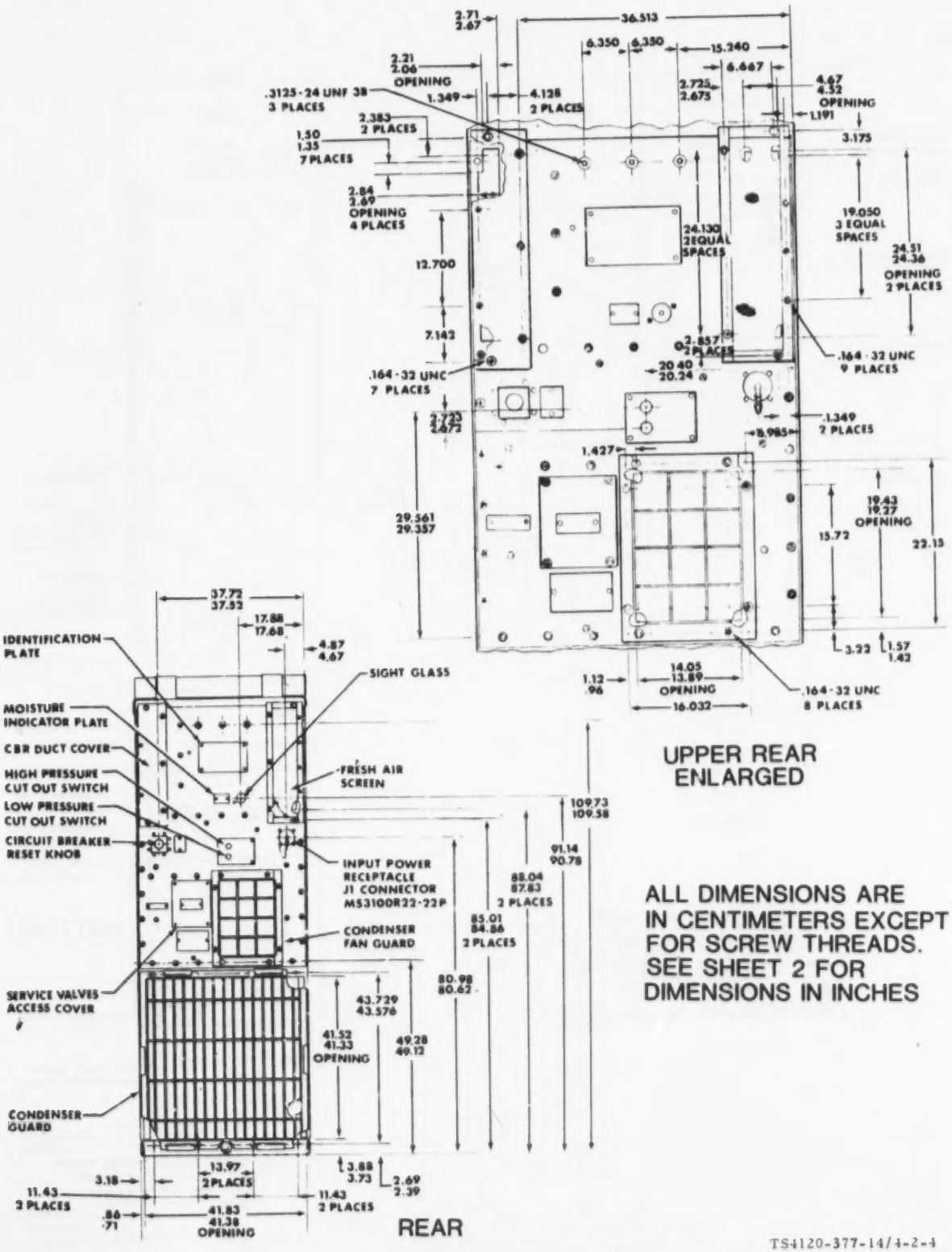


Figure 4-2. Installation Dimensions (Sheet 4 of 4)

(2) An unobstructed flow of air from outside the conditioned area to the inlet and outlet of the condenser.

(3) An unobstructed flow of air from inside the conditioned area to the conditioned air intake and discharge.

(4) An unobstructed flow of air from outside the conditioned area to the fresh air damper intake and/or CBR filter intake, if installed.

(5) Access to the front and back of the cabinet for routine operation and servicing and for necessary maintenance actions.

(6) Access to the top of the cabinet for removal of the top panel and sufficient headroom to allow maintenance actions and internal component removal and installation through the top panel opening.

(7) A source of 208 volt, 3 phase, 400 hertz input power rated at 24.4 amps. The power source outlet should be located as near as possible to the installed location of the air conditioner. The power source wiring must include a disconnect switch. However, provisions should be made to insure that power is not disconnected during normal operation and that the disconnect is not used to turn off the air conditioner for normal shut-down.

(8) An earth ground capable of handling 24.4 amps.

(9) Check that no source of dangerous or objectionable fumes are located near the fresh air intake.

(10) If possible make use of terrain features such as trees and buildings to provide a shaded location. This will minimize the cooling load on the air conditioner.

(11) If possible avoid locations where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke, or other debris.

b. Through the wall installation. Prepare an opening in the wall large enough to slide the air conditioner through. (See fig. 4-2, sheets 1, 2, 3, and 4.) Consideration should be given to service of internal components. All openings around air conditioner must be sealed air tight.

c. Inside installation. Manufacture an arrangement of ducts for the condenser intake and discharge air openings, and the fresh air damper intake and/or CBR filter intake, if installed. Ducts may be made for attachment to the air conditioner cabinet using the mounting holes for the condenser inlet and outlet guards, and the fresh air screen and/or the air intake on the CBR filter or some other arrangement may be made. Prepare appropriate openings in an exterior wall for the ducts. Ducts may be designed to use the condenser inlet and outlet guards, and the fresh air screen supplied with the air conditioner and relocated and installed on the new duct work. Adequate replacements or some other arrangement of these items may be provided.

CAUTION

Easy access to fresh or return air filters must be provided. Filters may be left in position in unit or relocated in duct work. Some installations (filters relocated in duct work) may require different size filters.

d. Outside installation. Manufacture an arrangement of ducts for the conditioned air intake and discharge air. Ducts may be made for attachment to the air conditioner cabinet using the mounting holes for the conditioned air intake and discharge grilles or some other arrangement may be made. Ducts may also be made for installation of the conditioned air intake and discharge grilles on the inside ends or replacements for these items may be used. Prepare appropriate openings in the appropriate wall for the ducts.

NOTE

Retain all items removed from unit. Store in a safe place. Parts must be reinstalled prior to return to supply. For a list of required items, see Appendix C.

4-6. AIR CONDITIONER PREPARATION FOR INSTALLATION

a. General. No preparation is necessary if the air conditioner is to be installed by the typical exterior wall opening method and operated as a self-contained unit. For alternate installation methods, some preparation is necessary.

b. The unit is designed to provide for several basic types of installation. See the following paragraphs for instructions only if they are applicable to your requirements.

(1) Remote mounting of control panel. (See para 4-7.)

(2) When power and/or control cable(s) are to be connected through the return air duct, see paragraph 4-8.

(3) Alternate input power cable connector locations. (See para 4-9.)

(4) Installations that require removal of the fabric cover. (See para 4-10.)

4-7. REMOTE MOUNTING OF CONTROL PANEL

This paragraph is applicable only when the control panel is to be remote mounted. If the control panel is to be removed from the unit and installed in a remote location, follow instructions of this paragraph.

WARNING

Be sure input power is disconnected before doing any work inside air conditioner cabinet. Voltages used can be lethal.

a. Using screwdriver, loosen two captive panel fasteners in lower front panel.

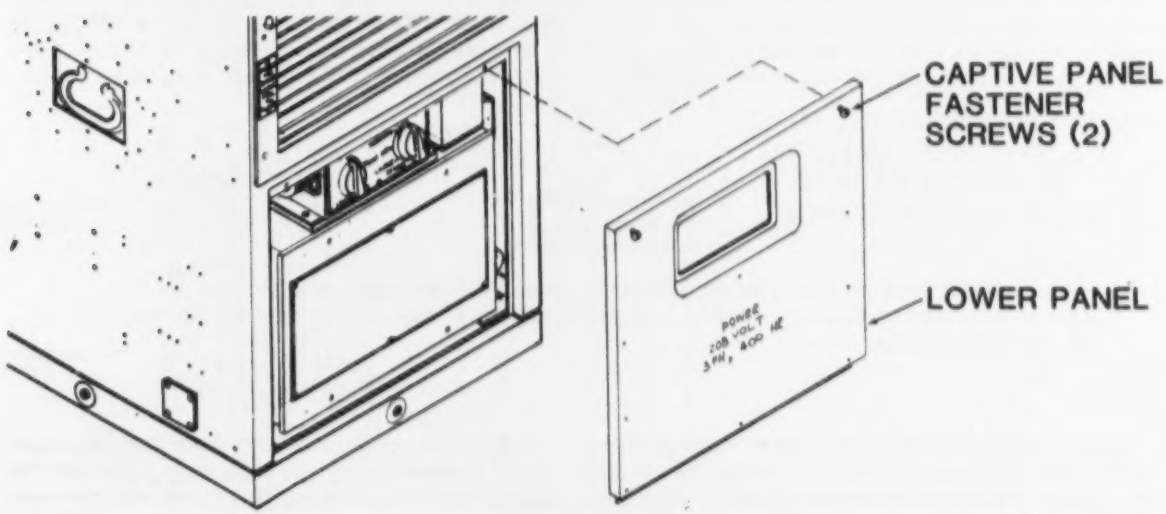


Figure 4-3. Lower Front Panel

TS4120-377-14/4-3

b. Tip top of lower front panel away from unit and lift panel up to clear flange on bottom of panel.

c. Using screwdriver, loosen six captive turnlock stud fasteners in intake grille assembly.

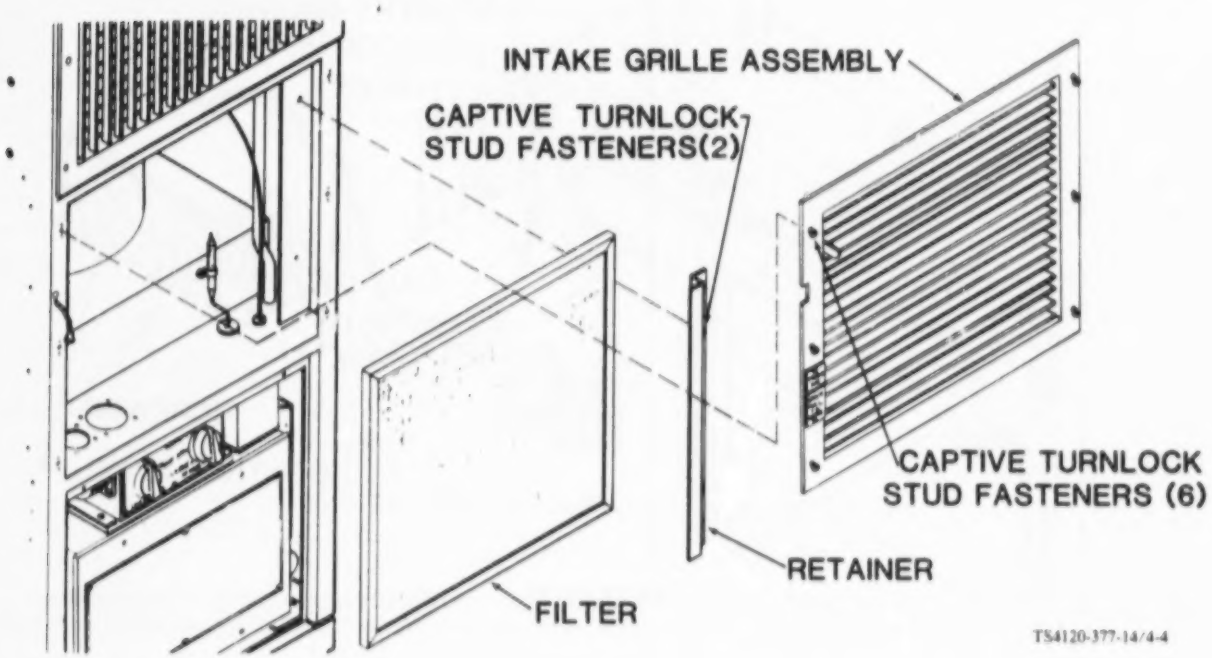


Figure 4-4. Intake Grille and Filter

d. Remove grille.

e. Using screwdriver, loosen two captive stud fasteners in filter retainer.

f. Remove retainer and filter.

g. Using screwdriver, remove screw, lock washer, flat washer, and clamp from remote sensing bulb.

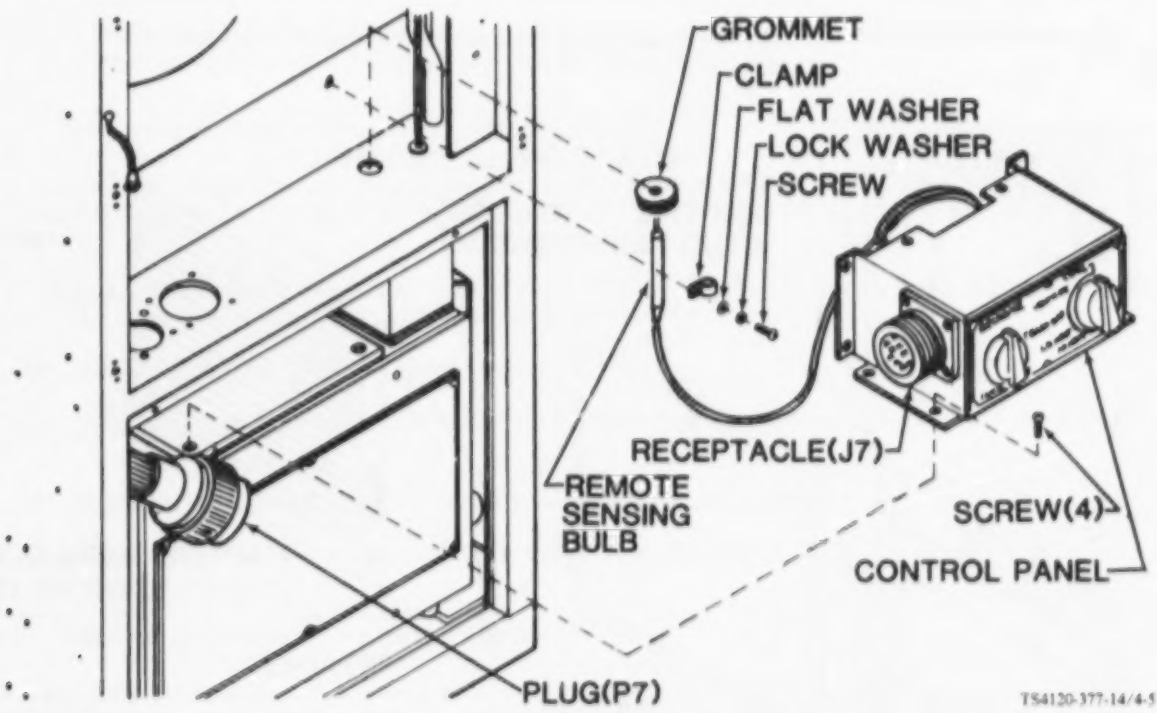


Figure 4-5. Control Panel

h. Disconnect plug (P7) from receptacle (J7).

i. Using screwdriver, loosen four captive panel fastener screws in junction box mounting flanges.

j. Carefully slip junction box out far enough to gain access to control panel mounting screws.

k. Using screwdriver, remove four screws from control box.

l. Remove grommet from remote sensing bulb capillary line.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal.

m. Carefully slip remote sensing bulb down through bulkhead hole and remove control panel from unit.

n. Using screwdriver, reinstall clamp, flat washer, lock washer, and screw for possible future use.

o. Reinstall grommet.

p. Seal hole in grommet air tight with silicone adhesive sealant, item 1, Appendix E.

q. Very carefully, coil capillary line and mount sensing bulb in loop clamp provided on back of control panel.

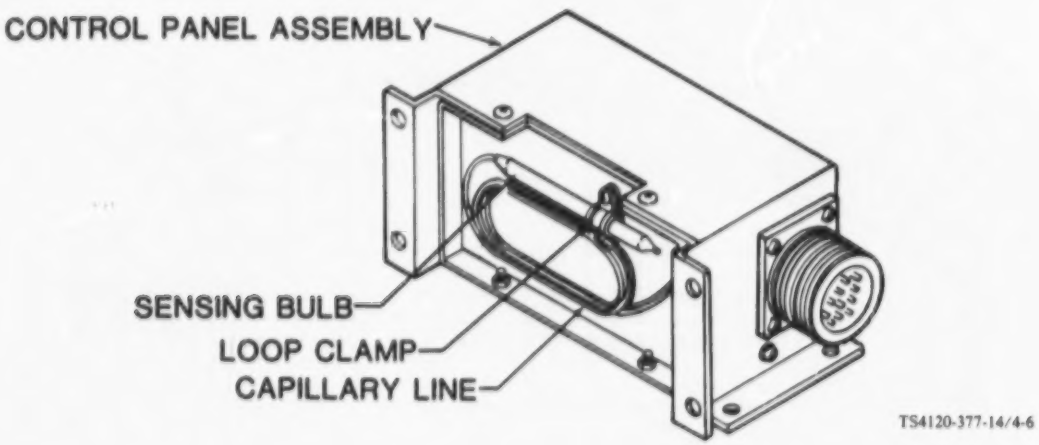


Figure 4-6. Sensing Bulb Secured for Remote Mounting

r. The control panel is provided with two sets of four holes. These holes are sized for use with 0.25 inch (0.64 cm) diameter hardware. The control panel can be mounted using the bottom or rear face holes.

s. Care should be taken to locate the control panel and sensing bulb where there will be an accurate temperature indication.

NOTE

Do not locate control panel on thin outside walls or near heat producing equipment or lights.

t. Secure the control panel using appropriate hardware in the remote location.

u. Carefully move junction box into position and secure with four captive panel screws.

v. Using screwdriver, install block off assembly using the four mounting screws removed from the control panel.

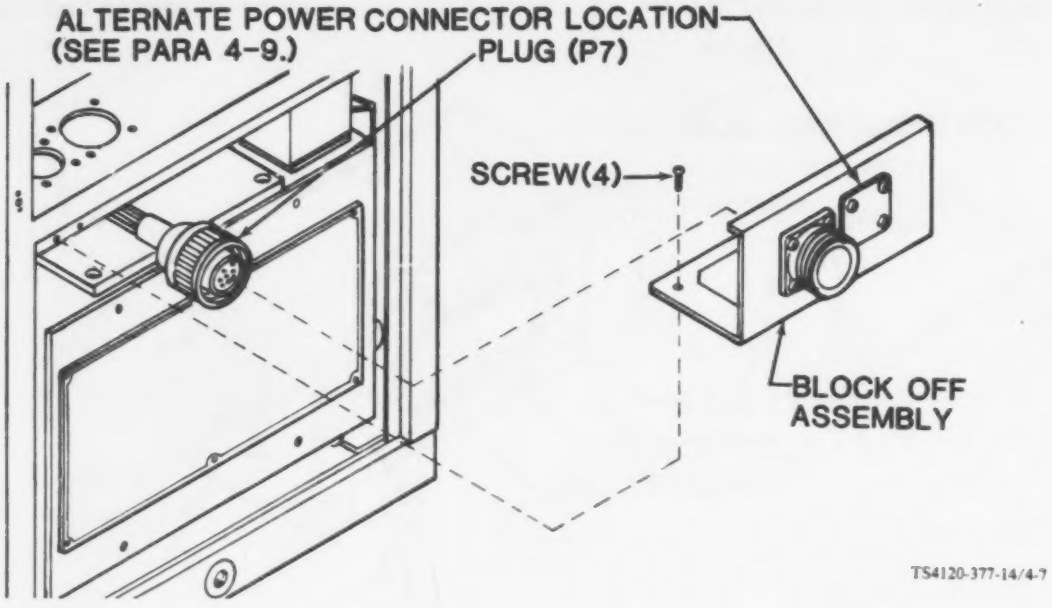


Figure 4-7. Block Off Assembly Installation

NOTE

If your unit was not supplied with a block off assembly, order part (97403) 13215E9885.

w. Connect plug (P7) to inside portion of bulkhead connector provided with block off assembly.

NOTE

Block off assembly is also equipped with a removable cover and mounting holes for alternate power connector location. (See para 4-9.)

x. Reinstall return air filter, retainer, intake grille, and lower panel.

y. Fabricate an interconnecting cable/harness of the required length to connect the P7 block off mounted connector and the J7 control panel connector.

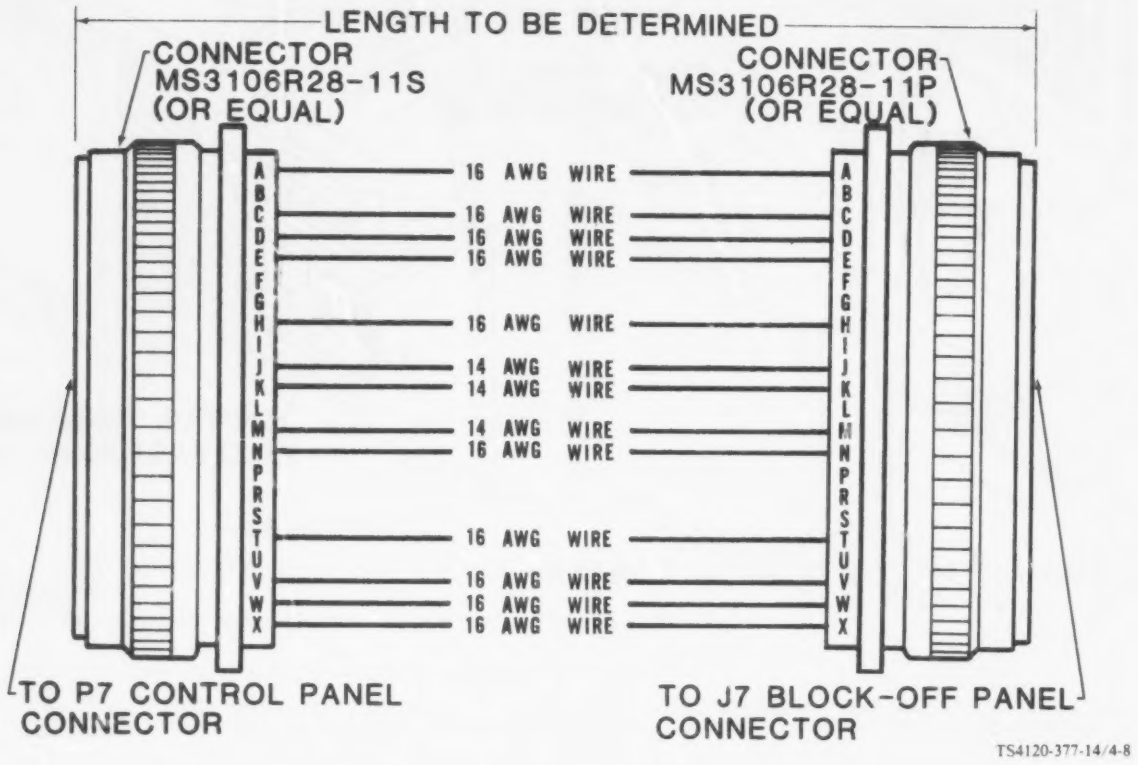

LENGTH TO BE DETERMINED
CONNECTOR MS3106R28-11S (OR EQUAL)
CONNECTOR MS3106R28-11P (OR EQUAL)
A B C D E F G H I J K L M N P R S T U V W X
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
14 AWG WIRE
14 AWG WIRE
14 AWG WIRE
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
16 AWG WIRE
TO P7 CONTROL PANEL CONNECTOR
TO J7 BLOCK-OFF PANEL CONNECTOR
TS4120-377-14/4-8

Figure 4-8. Interconnecting Remote Control Cable Diagram

z. Install interconnecting cable between block off assembly bulkhead connector and control panel receptacle (J7).

4-8. CABLE CONNECTIONS THROUGH RETURN (CONDITIONED AIR INTAKE) DUCT

This paragraph is applicable only when the conditioned air intake grille and filter (filter relocated in facility duct work) are to be removed from the unit and one or both of the alternate (input power or remote control connector) cable locations are to be used. These alternate cable connection locations permit cables to be routed through the return air ducting to the air conditioner.

WARNING

Be sure input power is disconnected before doing any work inside air conditioner cabinet. Voltages used can be lethal.

a. Using screwdriver, loosen six captive turnlock stud fasteners in intake grille.

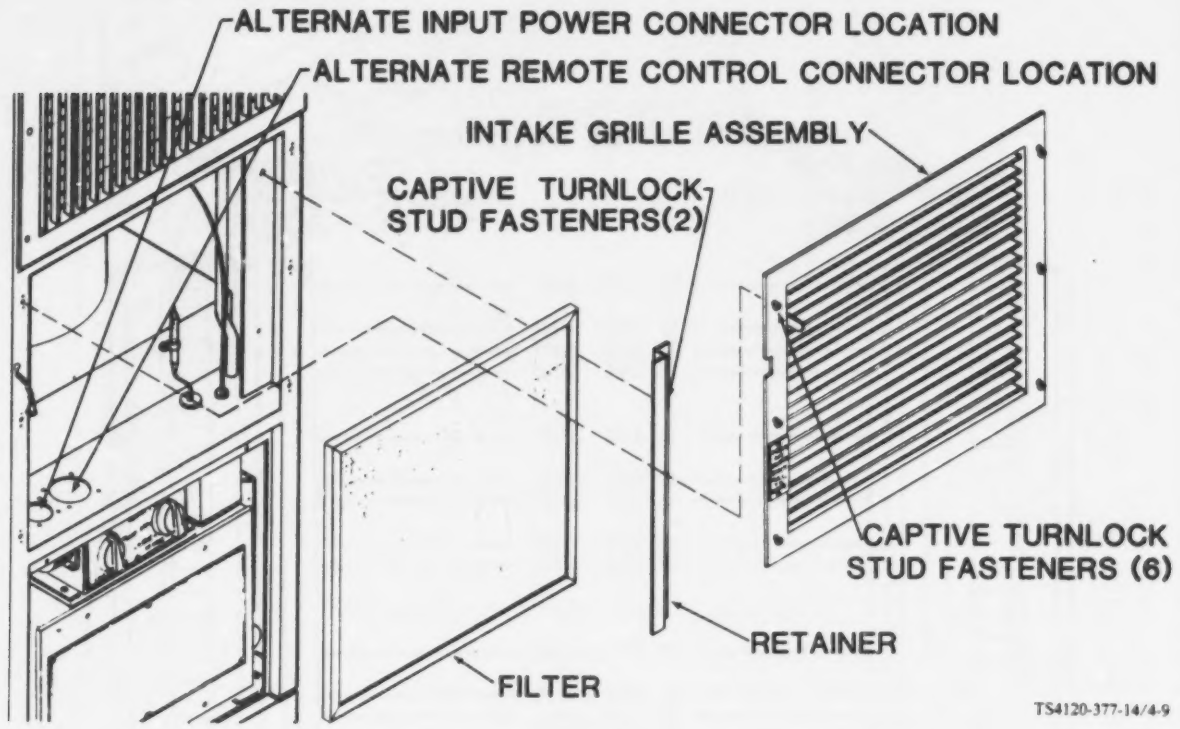


Figure 4-9. Alternate Cable Connections Through Return (Intake) Duct

b. Remove grille.

c. Using screwdriver, loosen two captive stud fasteners in filter retainer.

d. Remove retainer and filter.

e. If intake grille, retainer, and filter are not to be installed in facility duct work, store them in a safe place.

f. Using screwdriver, loosen two captive panel fasteners in lower front panel.

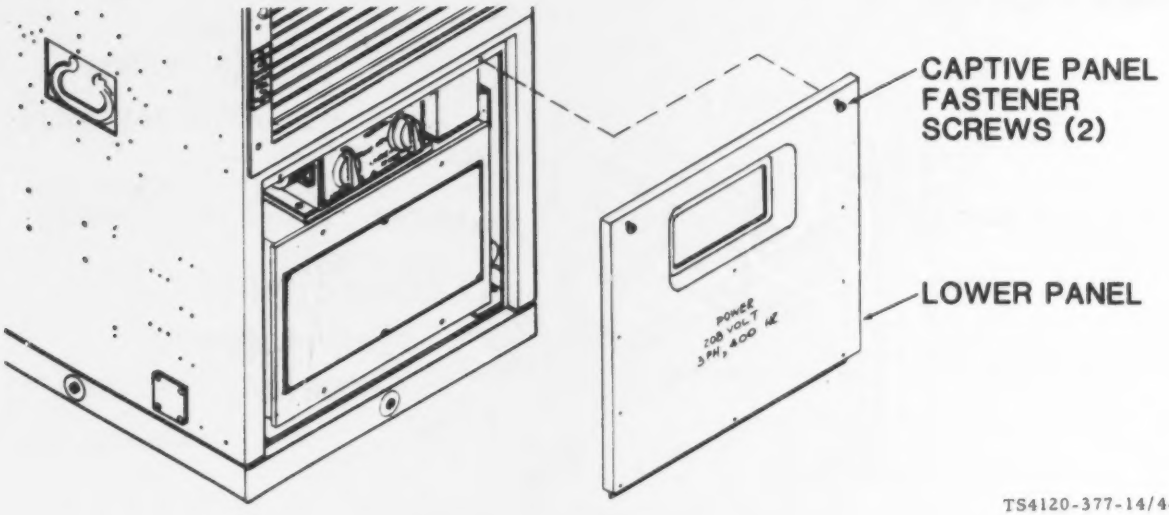


Figure 4-10. Lower Front Panel

g. Tip top of lower front panel away from unit and lift panel up to clear flange on bottom of panel.

h. When alternate remote control connector location is to be used:

(1) See paragraph 4-7 for remote mounting of control panel.

(2) Using screwdriver and wrench, remove four screws, lock washers, and nuts from cover plate.

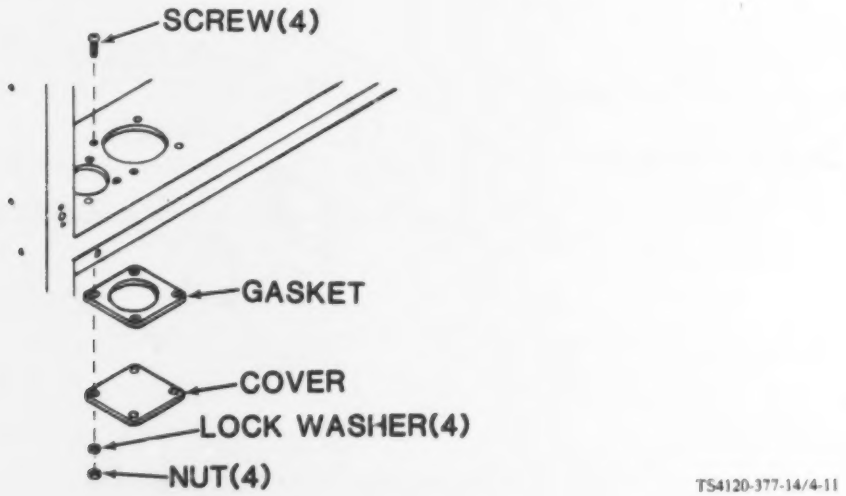


Figure 4-11. Cover Plate

(3) Remove cover and gasket.

(4) Using screwdriver and wrench, remove four screws, flat washers, and lock nuts from bulkhead connector in block off.

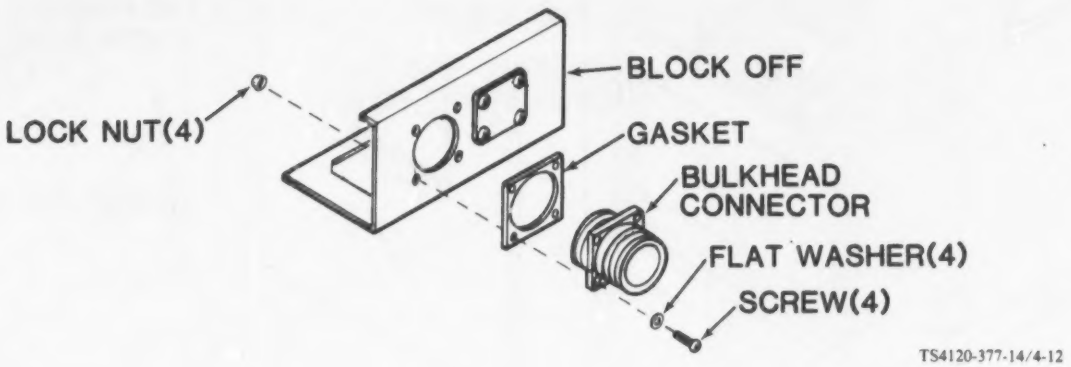


Figure 4-12. Bulkhead Connector Removal

(5) Remove bulkhead connector and gasket.

(6) Using screwdriver and wrench, install cover and gasket that were removed in steps (2) and (3) on block off with four screws, lock washers, and nuts.

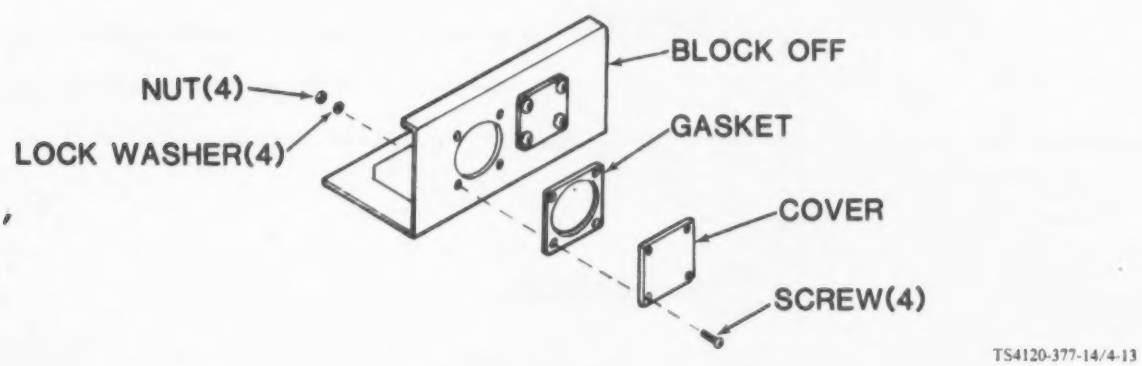


Figure 4-13. Cover Plate Installation

(7) Using screwdriver and wrench, install bulkhead connector and gasket that were removed in steps (4) and (5) on casing bulkhead with four screws, flat washers, and lock nuts.

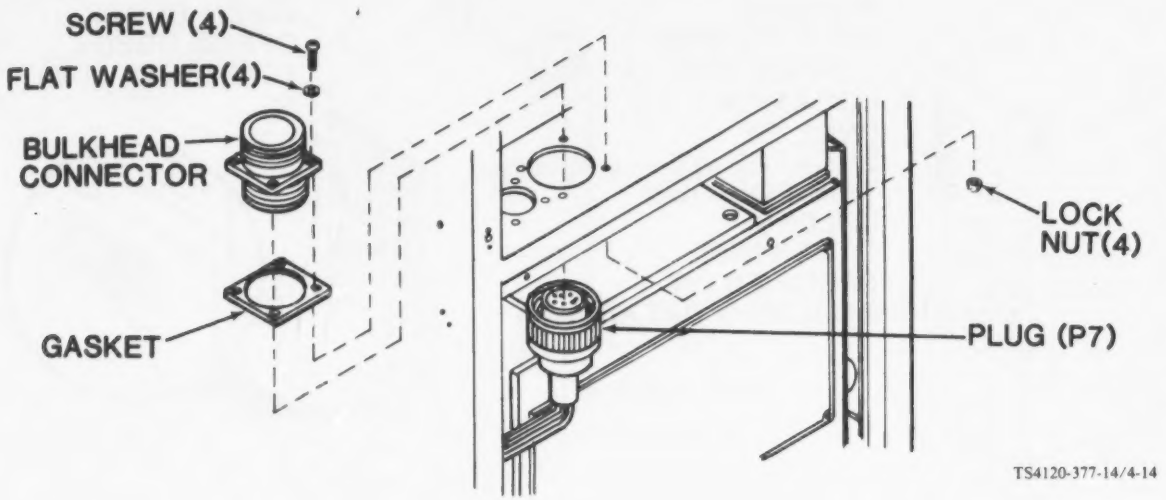


Figure 4-14. Bulkhead Connector Installation

(8) Connect plug (P7) to bottom of bulkhead connector.

(9) See paragraph 4-7. v. for fabrication of interconnecting control cable.

(10) Connect interconnecting control cable between top of bulkhead connector on unit and receptacle (J7) on the remote control panel.

NOTE

If power input cable is to be connected through intake duct skip step (11), and go to paragraph 4-9.

(11) Using screwdriver, reinstall lower panel.

i. When alternate input power connector is to be used, go to paragraph 4-9.

4-9. ALTERNATE INPUT POWER CABLE CONNECTOR (J1) LOCATIONS

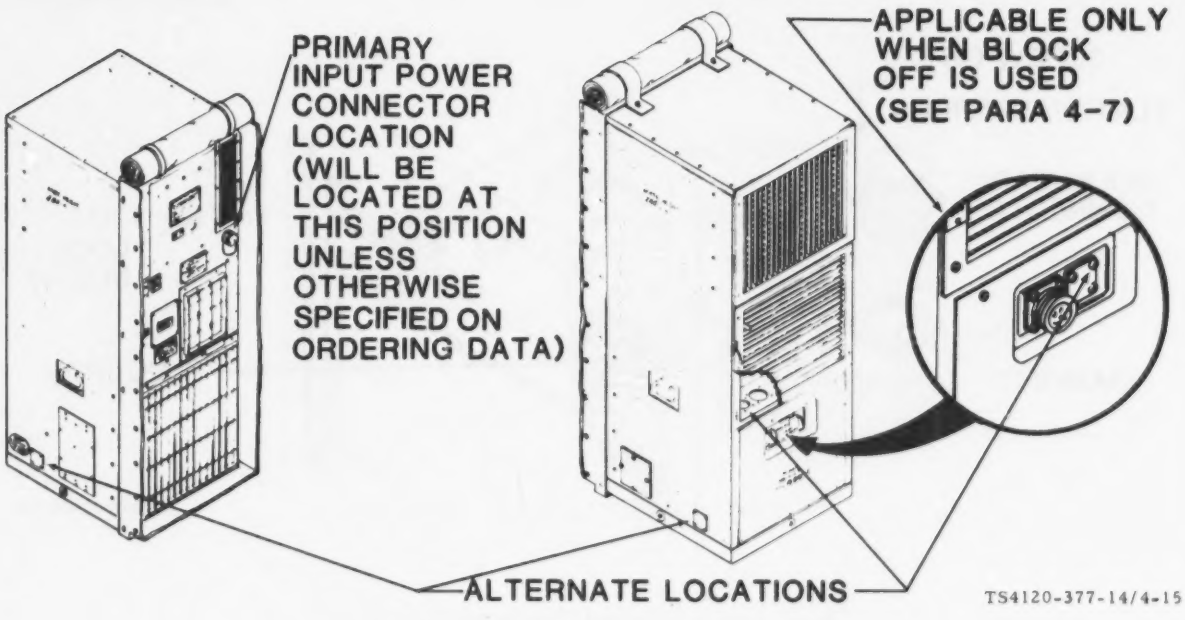

PRIMARY INPUT POWER CONNECTOR LOCATION (WILL BE LOCATED AT THIS POSITION UNLESS OTHERWISE SPECIFIED ON ORDERING DATA)
APPLICABLE ONLY WHEN BLOCK OFF IS USED (SEE PARA 4-7)
ALTERNATE LOCATIONS
TS4120-377-14/4-15

Figure 4-15. Alternate Input Power Connector Locations

The following instructions apply only if relocation of the input power cable connector is required.

Preliminary procedures:
1. Remove rear panel. (See para 4-32.)
2. Remove lower front panel. (See para 4-29.)
3. Remove conditioned air intake grille. (See para 4-24.)

a. Determine which alternate location is best.

b. Using screwdriver and wrench, remove four screws, lock washers, and nuts from cover plate.

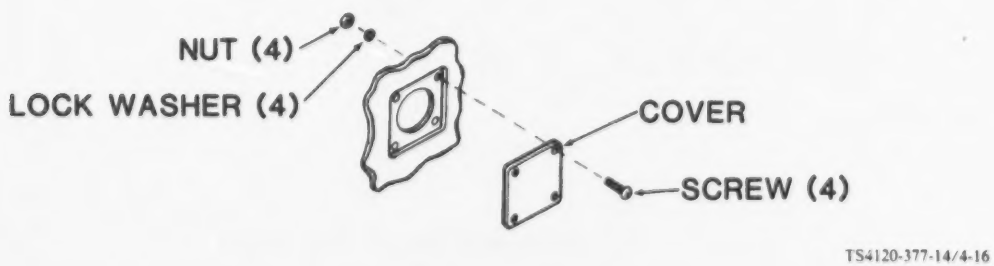


Figure 4-16. Cover Plate Removal/Installation

c. Remove cover plate and gasket if applicable.

d. Disconnect plug P13 from receptacle J13.

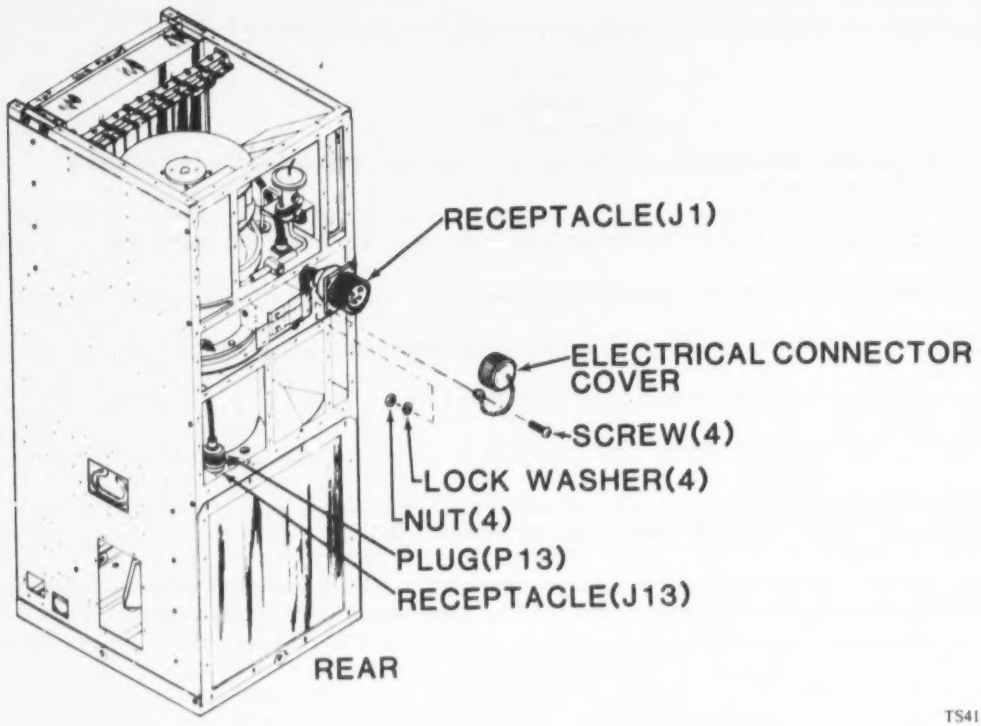


Figure 4-17. J1 to P13 Harness Removal

e. Remove the J1 to P13 harness from the unit.

f. Using screwdriver and wrench, remove four screws, lock washers, and nuts from receptacle (J13).

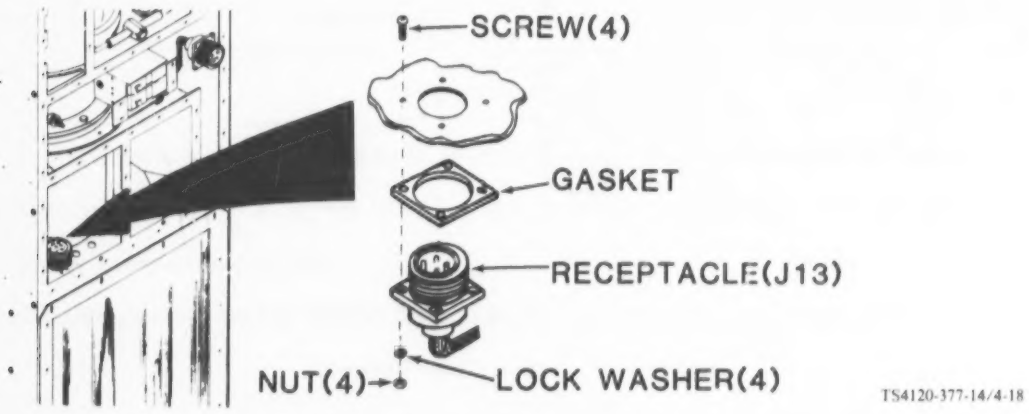


Figure 4-18. Receptacle (J13)

g. Pull receptacle (J13) down and out of bulkhead.

h. Reconnect harness plug P13 to receptacle J13.

i. Using screwdriver and wrench, install receptacle J1 into the new connector location.

NOTE

Take care that protective electrical connector cover that was removed at the rear panel is reinstalled at new location.

j. Install gasket and cover plates over connector hole patterns at bulkhead and rear panel.

k. Coil loose excess harness so that it will not be damaged.

Follow-on procedures:
1. Install conditioned air intake grille. (See para 4-24.)
2. Install lower front panel. (See para 4-29.)
3. Install rear panel. (See para 4-32.)

4-10. INSTALLATIONS THAT REQUIRE REMOVAL OF FABRIC COVER

Some installations require removal of the condenser side fabric cover. This generally applies only when the air conditioner is positioned inside with condenser and fresh air openings ducted to the outside.

NOTE

If air conditioner is to be installed with condenser side (rear) exposed, the fabric cover should be left in place if possible.

a. Using screwdriver, remove fourteen screws, four packing with retainer, and eighteen flat washers.

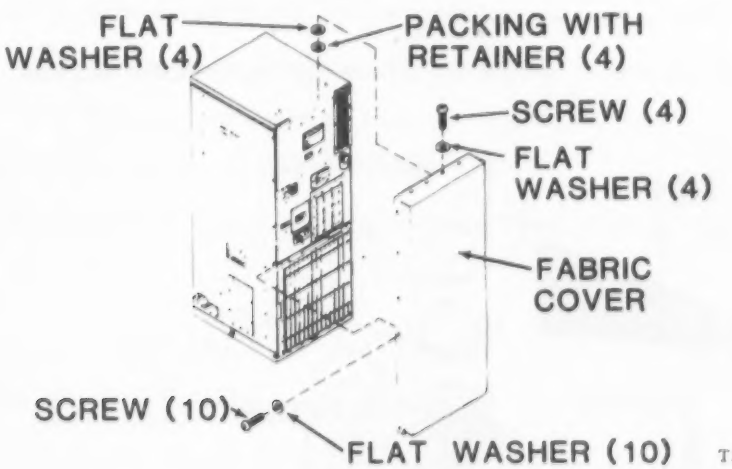


Figure 4-19. Fabric Cover Removal

b. Carefully remove the fabric cover. Store the cover in a safe place for future use.

4-11. INSTALLATION INSTRUCTIONS

All alterations to the shelter or facility into which the air conditioner is to be installed should be complete before installation of air conditioner.

WARNING

DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over.

a. Attach an overhead hoist through a sling and spreader bar to the lifting handles on each side of the cabinet.

b. Move air conditioner into position and aline mounting holes.

c. Secure unit with appropriate mounting hardware.

Base - .4375-14 UNC (4 holes)

Rear - .3125-24 UNF (3 holes)

d. Seal all openings around cutouts for air conditioner, air and water tight. Use gasket, caulking, or other suitable material.

e. The air conditioner is provided with four drain holes in base. (See figure 4-2.) Remove plugs from all drains possible for most complete drainage of condensate water. If water from these drains will be objectionable or create a hazard, external overboard drains can be connected. Use standard 1/2-14 NPT male pipe fittings to connect base drains. Any type of hose or tubing may be used as a drain line. The drain line should lead to an appropriate facility drain, storm sewer, dry sump, or an acceptable outside area. Be sure the entire length of the drain line is at the same height, or lower than the base to ensure gravity drainage.

f. Install a 10 AWG minimum ground wire between frame ground (FR-GND) on air conditioner cabinet and an adequate earth ground.

g. Fabricate a power cable. (See para 4-13.)

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

CAUTION

Do not connect P1 connector to air conditioner before making following checks.

h. Connect power cable to a 208 volt, 3 phase, 400 hertz power source. (See para 4-12 and figure 4-21.)

(1) Apply power to power cable.

(2) Use a multimeter set to AC voltage range of at least 250 volts for following tests.

(3) Measure voltage between pin D of connector P1 and a good chassis ground. Voltage must be zero (0). If more than zero voltage is observed, disconnect cable and check power source. Correct problem at power source or at cable connection as indicated.

(4) With zero voltage on pin D of P1 connector, check voltages between remaining pins as shown on following chart.

P1 CONNECTOR

Measure from Pin	To Pin			
	A	B	C	D
A	N/A	208	208	120
B	208	N/A	208	120
C	208	208	N/A	120
D	120	120	120	N/A

Voltages should be approximately as shown. If voltages are not within ten volts of those indicated on chart, disconnect power. Locate and correct problem.

CAUTION

Check that mode selector switch is OFF.

(5) After proper voltages are indicated on all pins of connector P1, connect P1 to connector J1 on air conditioner.

NOTE

The following steps require two people. One must be at control panel. The other must be in position at rear of air conditioner to see condenser fan rotation. (Condenser fan can be seen through condenser air outlet grille, figure 1-2, item 16.)

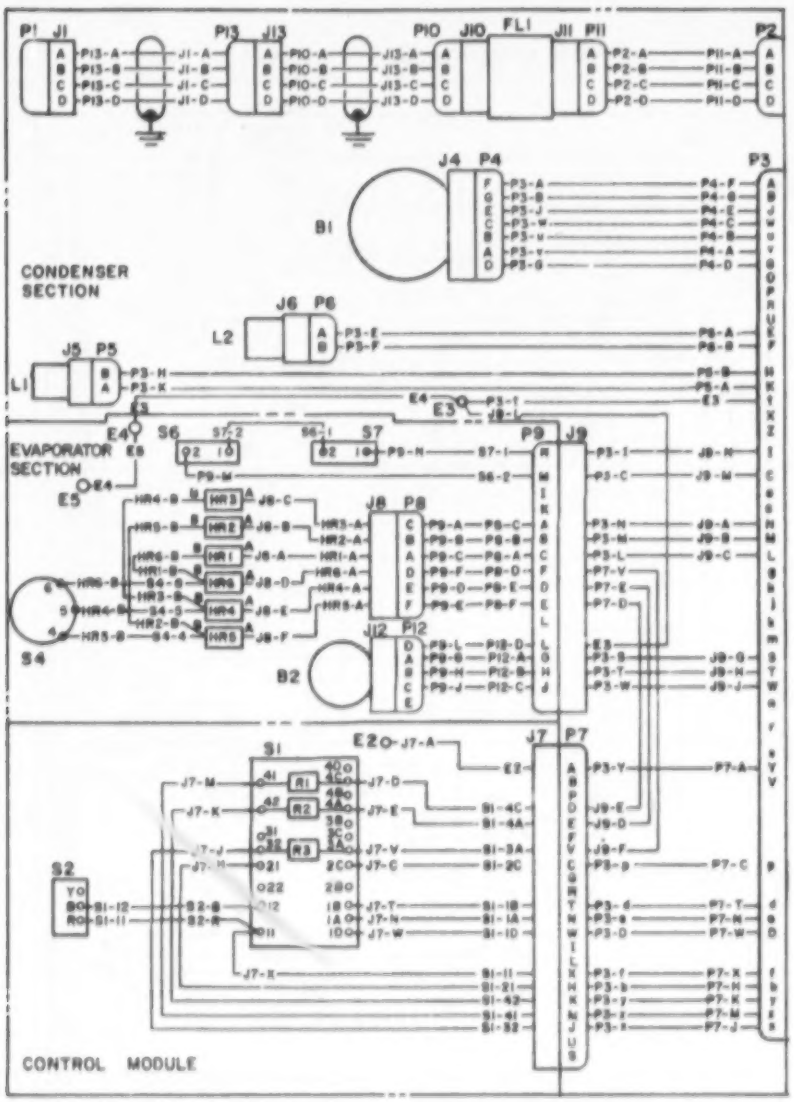
(6) The person at control panel should turn mode selector switch to VENT and immediately back to OFF.

(7) The person at rear of unit should watch condenser fan to determine direction of rotation. Fan blades must turn toward grille.

(8) If fan blades turn away from grille, unit power cable is not connected properly. Exchange wires connected to pins A and B at power source connection and repeat steps (6) and (7) above.

(9) Check unit operation in accordance with para 2-6 and 2-7.

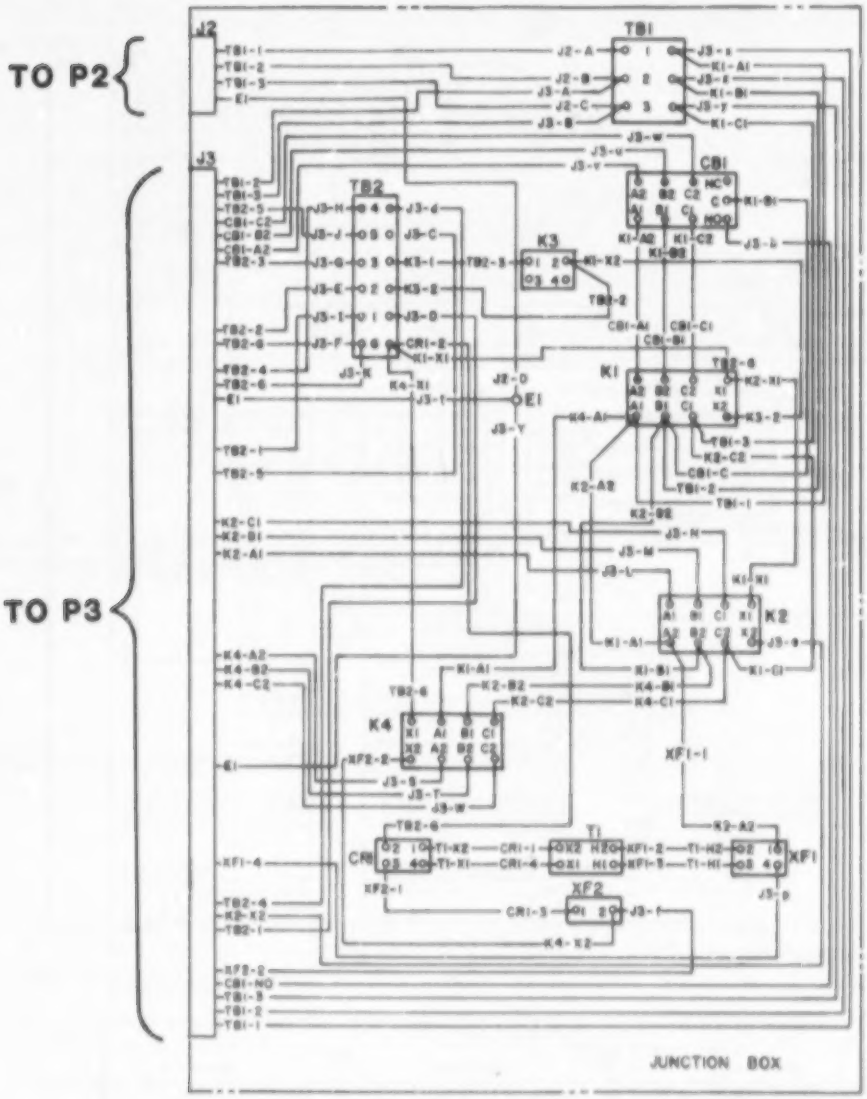
i. See air conditioner wiring diagram, figure 4-20, and electrical schematic, figure 4-20A, for additional wiring information.



COMPONENT REFERENCE LIST					
ELEC REF DES	DESCRIPTION	ELEC REF DES	DESCRIPTION	ELEC REF DES	DESCRIPTION
B1	MOTOR, COMPRESSOR	J9	CONNECTOR	P8	CONNECTOR, HEATER
B2	MOTOR, FAN	J10	CONNECTOR, FILTER INPUT	P9	CONNECTOR
CB1	CIRCUIT BREAKER, COMPRESSOR	J11	CONNECTOR, FILTER OUTPUT	P10	CONNECTOR, FILTER INPUT
CR1	RECTIFIER	J12	CONNECTOR, FAN MOTOR	P11	CONNECTOR, FILTER OUTPUT
E1	TERMINAL STUD (JUNCTION BOX END)	J13	CONNECTOR, POWER	P12	CONNECTOR, FAN MOTOR
E2	TERMINAL STUD	K1	RELAY, COMPRESSOR START	P13	CONNECTOR, POWER
	(CONTROL MODULE END)	K2	RELAY, HEATER	R1,R2,R3	RESISTOR (MIL-R-39008/3)
E3	TERMINAL STUD (CONDENSER END)	K3	RELAY, TIME DELAY	S1	SWITCH, ROTARY
FL1	FILTER, RADIO FREQUENCY	K4	RELAY, FAN	S2	THERMOSTAT
HR1-6	HEATER ELEMENT	L1	VALVE, SOLENOID, LIQUID LINE	S4	SWITCH, HEATER CUTOUT
J1	CONNECTOR, POWER INPUT	L2	VALVE, SOLENOID, EQUALIZER	S6	SWITCH, HIGH PRESSURE CUTOUT
J2	CONNECTOR, JUNCTION BOX	P1	CONNECTOR, POWER INPUT	S7	SWITCH, LOW PRESSURE CUTOUT
J3	CONNECTOR, JUNCTION BOX	P2	CONNECTOR, JUNCTION BOX	T1	TRANSFORMER
J4	CONNECTOR, COMPRESSOR	P3	CONNECTOR, JUNCTION BOX	TB1	TERMINAL BOARD, JUNCTION BOX
J5	CONNECTOR, SOLENOID VALVE,	P4	CONNECTOR, COMPRESSOR	TB2	TERMINAL BOARD, JUNCTION BOX
	LIQUID LINE	P5	CONNECTOR, SOLENOID VALVE,		(MIL-T-55164/1)
J6	CONNECTOR, SOLENOID VALVE,		LIQUID LINE	XF1	FUSEHOLDER
	EQUALIZER	P6	CONNECTOR, SOLENOID VALVE,	XF2	FUSEHOLDER
J7	CONNECTOR, CONTROL MODULE		EQUALIZER		
J8	CONNECTOR, HEATER	P7	CONNECTOR, CONTROL MODULE		

TS4120-377-14/4-21-1

Figure 4-20. Wiring Diagram (Sheet 1 of 2)



TS4120-377-14/4-21-2

Figure 4-20. Wiring Diagram (Sheet 2 of 2)

NOTE

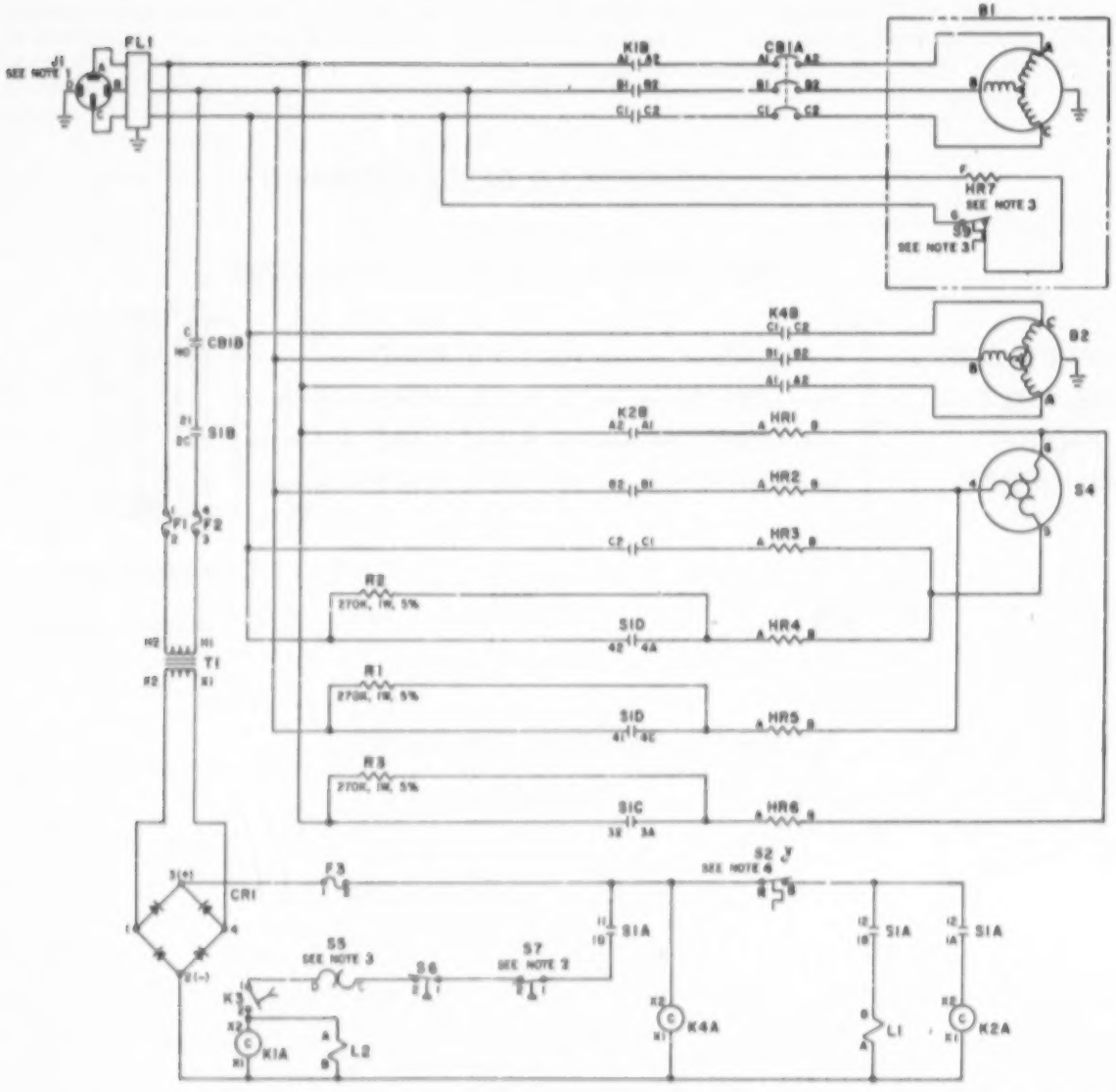
1 INPUT PHASE ORIENTATION FOR MAIN POWER RECEPTACLE, J1, SHALL BE AS FOLLOWS:

PIN A - PHASE A
PIN B - PHASE B
PIN C - PHASE C
PIN D - GROUND

2 SWITCH S7, IS SHOWN IN PRESSURE ENERGIZED POSITION.

3 THERMAL SWITCH, S5, CRANKCASE HEATER, HR7, AND THERMOSTATIC SWITCH, S9, ARE PART OF COMPRESSOR MOTOR, B1.

4 THERMOSTATIC SWITCH, S2, CONTACTS CLOSE WHEN AMBIENT TEMPERATURE FALLS 2.5°F BELOW SETTING AND OPEN WHEN AMBIENT TEMPERATURE RISES 2.5°F ABOVE SETTING.



TS4120-377-14/4-21A

Figure 4-20A. Electrical Schematic

4-12. INPUT POWER CABLE

b. Fabricate input power cable in accordance with figure 4-21. Cable must be shielded with QQ-B-575, tubular wire braid 0.50 (1.27 cm) ID or equal and grounded to each connection end.

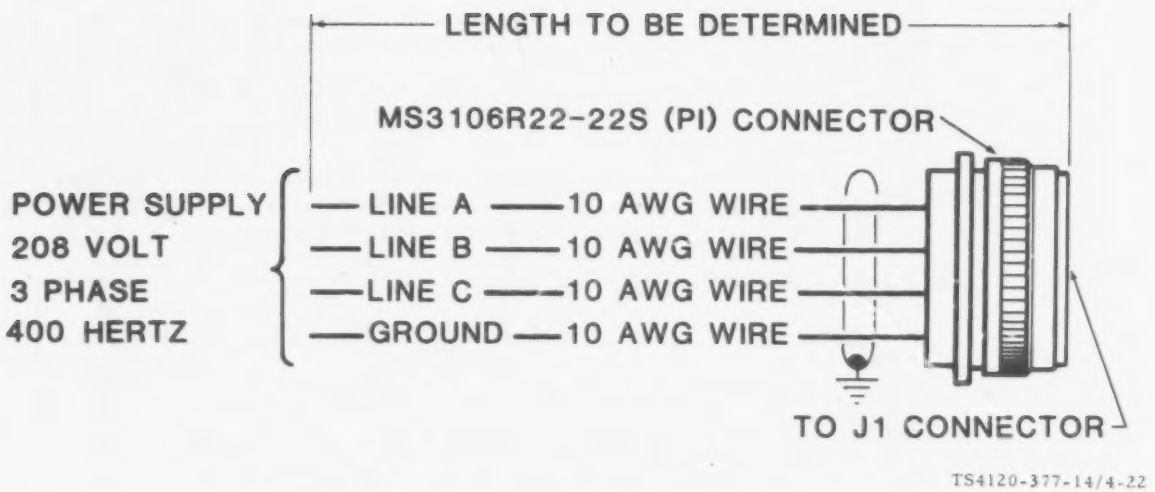


Figure 4-21. Input Power Cable Diagram

Section III LUBRICATION

4-13. GENERAL

The refrigerant compressor and its drive motor are hermetically sealed in a canister. The compressor crankcase has a lifetime supply of oil and the drive motor has permanently lubricated, sealed bearings. No lubrication of these items is required.

4-14. MECHANICAL LUBRICATION

The only mechanical items which may require lubrication are the louvers in the conditioned air intake and discharge grilles and the devices which operate the fresh air damper door. These points should be checked and lubricated, as necessary, during preventive maintenance service. A few drops of light oil should be applied to pivot points, bearing surfaces, hinges, and linkages to prevent or eliminate stiffness or binding. Be sure to wipe off all excess oil with a cloth or paper towel. These items are in areas of high volume air flow and excess oil will tend to attract and accumulate dust particles from the passing air. Graphite may be used as an alternate lubricant during extreme cold weather operation.

Section IV PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-15. INTRODUCTION, INSPECTION, AND SERVICE

a. Systematic, periodic, Preventive Maintenance Checks and Services (PMCS) are essential to ensure that the air conditioner is ready for operation at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the indoctrination of operators to report all unusual conditions noted during daily checks or actual operation to organizational maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

b. A schedule for organizational preventive maintenance inspection and service should be established immediately after installation of the air conditioner. A quarterly interval, equal to three calendar months or 250 hours of operation (whichever occurs first) is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.

c. Table 4-1 lists the organizational preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime.

WARNING

Disconnect input power before disassembly of air conditioner for PMCS to prevent dangerous, possibly fatal, electrical shock.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

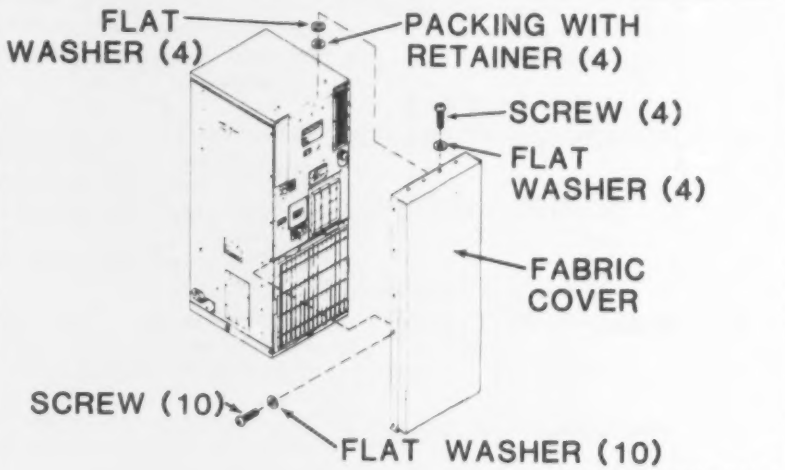
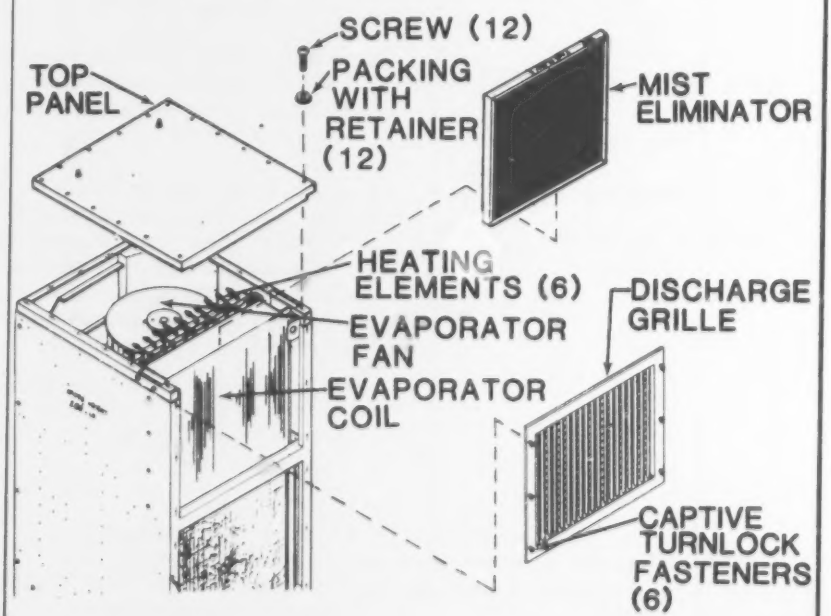
Item No.	Item To Be Inspected/Serviced	Procedures
1	Fabric Cover	 TS4120-377-14/4-T41-1 a. Roll down the cover and inspect for tears, cracks, or any other sign of damage or deterioration. b. If the necessity of washing is indicated, use fresh water with a small amount of a mild detergent. c. Reroll and secure the cover in the stowed position. If the cover was washed, be sure it is thoroughly dry before rerolling.  TS4120-377-14/4-T41-2

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

Item No.	Item To Be Inspected/Serviced	Procedures
2	Conditioned Air Discharge Grille	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille as necessary.
3	Mist Eliminator	a. Remove screws, flat washers, and packing with retainers from upper portion of fabric cover to gain access to top panel. b. Remove, clean, and inspect the top panel. c. Remove, clean, inspect, and service the mist eliminator. (See para 4-35.) d. Replace the mist eliminator if it is damaged.
4	Evaporator Coil	a. Clean evaporator coil per para 4-64. b. Inspect coil for obvious damage and all mounting hardware for tightness and security.
5	Heating Elements	a. Wipe or vacuum any remaining dust or dirt from the heating elements, the heater thermostat, and all other components and surfaces in the area. **NOTE** Use a clean, dry cloth (or one slightly moistened with water) for all wiping operations. NEVER use an oily or greasy cloth. Any oily residue left on any surface will attract and accumulate much more dust and dirt than dry surfaces. b. Inspect heating elements and thermostat for obvious damage, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.
6	Evaporator Fan	a. Wipe or vacuum all dust or dirt from the fan and all other components and surfaces in the area. b. Inspect the fan for damage or bent blades and all mounting hardware for tightness and security. c. Check that fan spins freely. d. Generally inspect refrigeration system components in the upper section for condition.

TABLE 4-1 ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

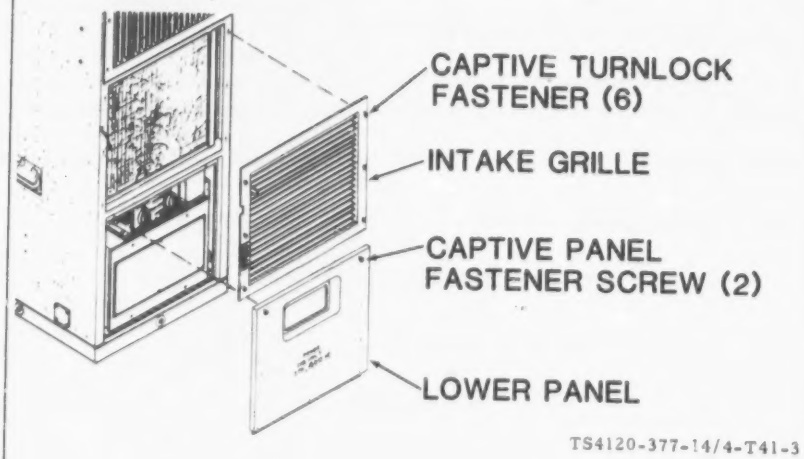
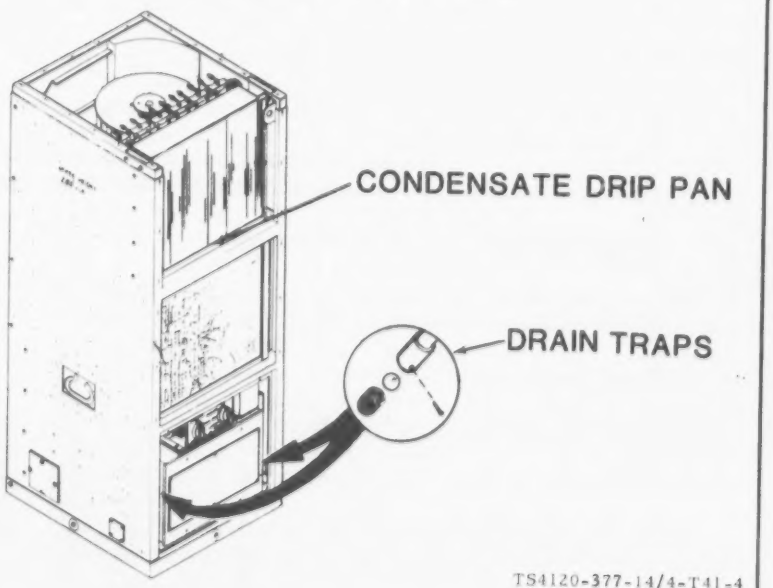
Item No.	Item To Be Inspected/Serviced	Procedures
7	Conditioned Air Intake Grille	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille as necessary.  TS4120-377-14/4-T41-3
8	Lower Front Panel	Remove, clean, and inspect the front panel.
9	Condensate Drip Pan, Drain Tubes, and Drain Traps	 TS4120-377-14/4-T41-4 a. Wipe any dust or dirt out of the condensate drip pan. b. Pour about one cup of clean fresh water into the condensate drip pan and watch for it to flow through the drain traps at the bottom end of the drain tubes.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

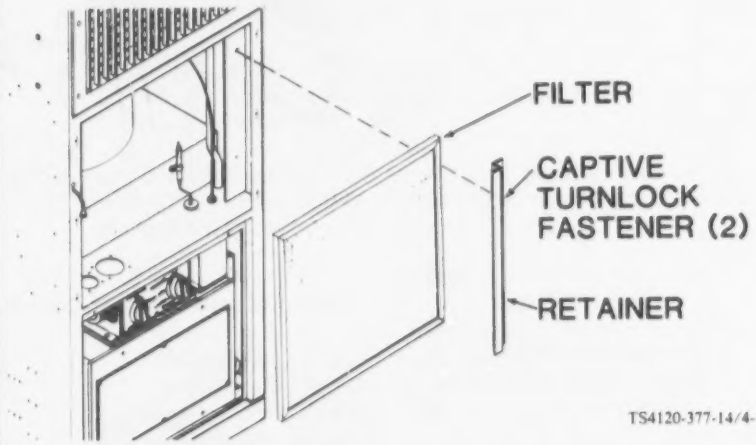
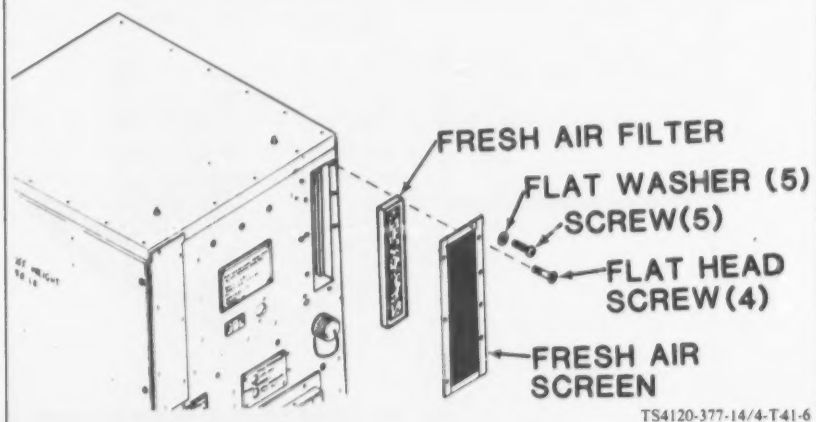
Item No.	Item To Be Inspected/Serviced	Procedures
		c. If the water does not flow through the traps, or if the discharged water has a muddy appearance, remove the cotter pin, spring, and ball from the bottom end of the drain tubes and thoroughly flush the tubes. If the tubes are clogged, insert a flexible wire from either the top or bottom end and agitate until the clog is removed. Pour additional water in the drip pan until an unrestricted flow of clean water is achieved. Check that ball and spring are clean and in good condition. Reinstall the ball, spring, and cotter pin in drain traps.
10	Conditioned Air Filter	 TS4120-377-14/4-T41-5 a. Remove, clean, and inspect filter. (See para 4-33.) b. Discard filter and obtain replacement, if damaged.
11	Fresh Air Filter	 TS4120-377-14/4-T41-6 a. Remove, clean, and inspect filter. (See para 4-34.) b. Discard filter and obtain replacement, if damaged.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

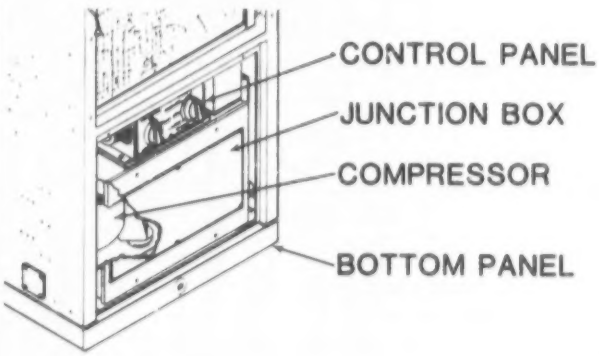
Item No.	Item To Be Inspected/Serviced	Procedures
12	Fresh Air Damper	a. Wipe or vacuum all dust or dirt from the fresh air damper door and its operating mechanism, and all other surfaces in the area. b. Inspect components for condition, and all mounting hardware for tightness and security. c. Check operation of door and mechanism for stiffness and binding; lubricate as necessary. Be sure to wipe off all excess lubricant. d. Check to be sure the damper door seats properly to form a seal when in the closed position.  TS4120-377-14/4-T41-7
13	Control Panel	a. Check operation of controls for stiffness or binding. b. Inspect wiring harness for damage or chafing, and all electrical connections for tightness. c. Check capillary to temperature sensing bulb for damage or kinking. d. Check all mounting hardware for tightness and security.
14	Compressor	a. Wipe or vacuum all dust or dirt from the compressor canister, and all other remaining components and surfaces in the lower section of the cabinet. b. Inspect the compressor crankcase heating element and associated thermostat for condition. c. Inspect wiring harness for damage or chafing, and all electrical connections for tightness. d. Check all compressor mounting hardware for tightness and security. e. Check all remaining refrigeration system components in the lower section of the cabinet for general condition.
15	Junction Box	a. Check operation of circuit breaker and flexible cable to remote reset know for stiffness and binding. b. Inspect all remaining wiring harnesses in the lower section of the cabinet for damage or chafing, and all electrical connections for tightness.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

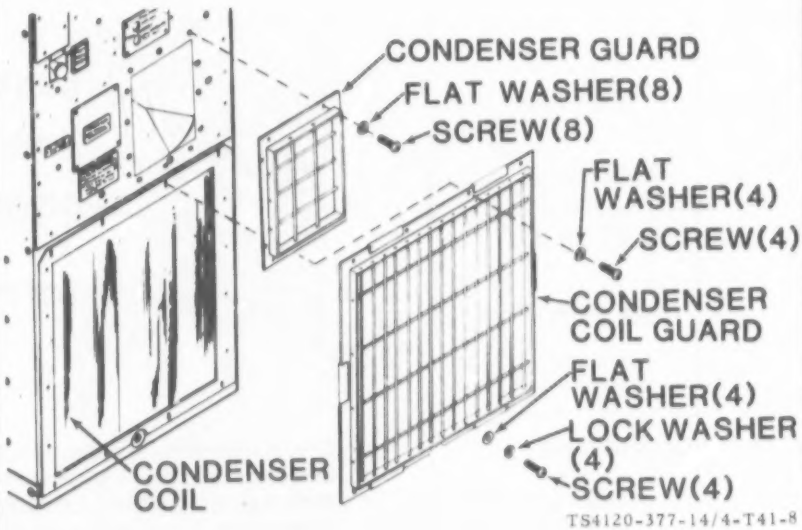
Item No.	Item To Be Inspected/Serviced	Procedures
16	Bottom Panel	a. Wipe or vacuum all dust, dirt, sand, or other foreign matter from surfaces and water passages in the bottom panel assembly. b. Check that water flows freely through the installed condensate drain(s).
17	Condenser (Air Outlet) Guard	Remove, clean, and inspect.  TS4120-377-14/4-T41-8
18	Condenser Coil Guard	Remove, clean, and inspect.
19	Condenser Coil	a. Clean condenser coil per para 4-65. b. Inspect coil for obvious damage, and all mounting hardware for tightness and security.
20	Condenser Fan and Evaporator/Condenser Fan Drive Motor	a. Wipe or vacuum all dust and dirt from fan and motor, and all other components and surfaces in the immediate area. b. Inspect the fan for damage or bent blades, the motor for signs of overheating, and all mounting hardware for tightness and security. c. Inspect the wiring harness for damage or chafing, and all electrical connections for tightness.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

Item No.	Item To Be Inspected/Serviced	Procedures
		REINSTALL THE FOLLOWING ITEMS: • Condenser Coil Guard • Condenser Outlet Guard • Fresh Air Filter and Screen • Conditioned Air Filter and Retainer • Lower Front Panel • Conditioned Air Intake Grille • Mist Eliminator • Top Panel • Conditioned Air Outlet Grille • Fabric Cover (Partial) Check to be sure that all items are back in place and secure.
21		a. Be sure the mode selector switch is in the OFF position and reconnect input power. **CAUTION** Do not check operation in COOL mode until after input power has been reconnected for a sufficient time to eliminate any danger of liquid refrigerant accumulation in the compressor. Except in extremely cold conditions, if input power has been disconnected for a period of less than six hours, an equal warm-up period should be allowed. If the disconnected period has been more than six hours, a full six hour warm-up period is necessary. b. Check that the fabric cover is rolled up and secured. c. Adjust conditioned air intake and outlet louvers to the full open position. d. Adjust fresh air damper to full closed position. e. Turn mode selector switch to VENTILATE. Fan should start. f. Use a paper streamer or smoke and note amount of air being discharged from conditioned air outlet grille. g. Open fresh air damper fully. h. Close conditioned air intake grille louvers fully. i. Again check air flow as in step f. above. Air flow should be approximately the same. j. Fully open louvers in conditioned air intake grille and fully close fresh air damper.

TABLE 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

Item No.	Item To Be Inspected/Serviced	Procedures
		k. Turn TEMPerature control thermostat knob to fully INCREASE (clockwise) position and then turn mode selector switch to LO HEAT. Place your hand in air flow from the conditioned air outlet grille and feel for a temperature rise. When discharge air temperature has reached a relatively stable level, turn mode selector switch to HI HEAT and feel for a further temperature rise. Next, turn TEMPerature control thermostat knob to fully DECREASE (counterclockwise) position. Feel that discharge air temperature drops to approximately same relatively stable level previously noted in LO HEAT. Finally, turn mode selector switch to LO HEAT and feel discharge air temperature drop to ambient level. **NOTE** The temperature control thermostat has an effective functional range between 40°F and 90°F (5°C and 32°C). In extreme conditions when ambient air temperature is below 40°F (5°C) or above 90°F (32°C), operation in either LO HEAT or HI HEAT mode will vary from that described above. l. Turn TEMPerature control thermostat knob to fully INCREASE (clockwise) position, then turn mode selector switch to COOL. Note that evaporator and condenser fans start immediately and that compressor starts approximately 30 seconds later. Hold your hand in air flow from condensed air outlet grille; there should be no change in temperature. Now turn TEMPerature control thermostat knob to fully DECREASE (counterclockwise) position and feel outlet air temperature begin to drop almost immediately. Leave controls in present position and perform next check. m. After 15 minutes of operation check the sight glass and compare refrigerant condition with the color coded information plate provided. (See para 2-3.) n. Turn mode selector switch to OFF and observe that all air conditioner functions cease. o. Set-up the air conditioner for the desired operational mode. p. Record performance of quarterly PMCS, including all corrective actions taken.

Section V TROUBLESHOOTING

4-16. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This Manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

c. Table 4-2 lists the common malfunctions which you may find during the operation or maintenance of the air conditioner unit or its components. You should perform the tests/inspections and corrective actions in the order listed.

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

HIGH VOLTAGE
is used in operation of this equipment.
DEATH ON CONTACT
may result if personnel fail to observe safety precautions.

Never work on electrical equipment unless there is another person nearby who is familiar with operation and hazards of equipment and who is competent in administering first aid. When technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, input power supply to equipment must be shut off before beginning work. Take particular care to ground every capacitor likely to hold a dangerous charge. When working inside, after power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 208 volts ac input when installing or operating this equipment.

Whenever nature of operation permits, keep one hand away from equipment to reduce hazard of current flowing through vital organs of body.

Do not operate equipment without all grilles, guards, louvers, and covers in place and tightly secured.

Warning: Do not be misled by term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

Table 4-2. TROUBLESHOOTING

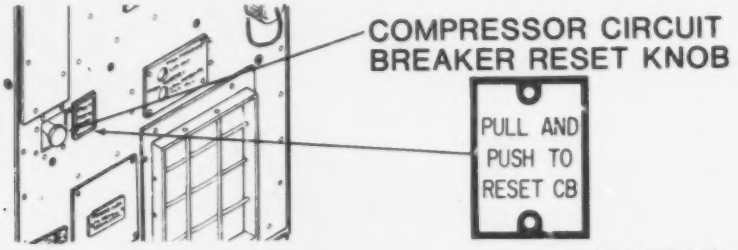
MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

Step 1. Check to see if input power has been disconnected.
Connect input power.

Step 2. Make sure that power is 208 volt, 3 phase, 400 hertz.
Connect correct input power.

Step 3. Check to see if compressor circuit breaker is tripped.
Slowly PULL out AND PUSH in reset knob TO RESET Circuit Breaker.



TS4120-377-14/4-T42-1

Step 4. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses. (See para 4-43.)
Tighten or replace connectors, or repair damaged wires.

Step 5. Check fuses. (See para 4-52.)
Replace bad fuse(s).

Step 6. Check operation of the auxiliary switch in circuit breaker (CB1).
Test (CB1) auxiliary switch. (See para 4-51.) Replace circuit breaker if auxiliary switch is defective.

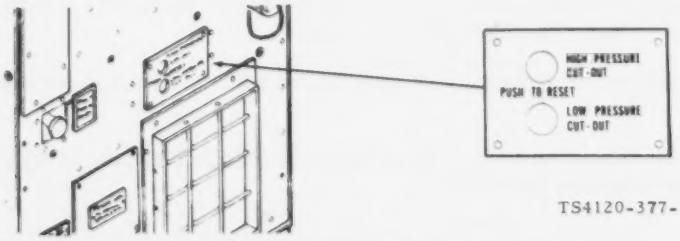
Step 7. Check operation of control power transformer (T1).
Test transformer. (See para 4-50.) Replace transformer, if defective.

Step 8. Check operation of RFI Filter (FL1) and d.c. rectifier (CR1) assembly.
Test filter and rectifier. (See para 4-44 and 4-53.) Replace defective filter or rectifier.

Step 9. Check all terminals and internal wiring within junction box for tightness and damage.
Tighten terminals, or repair wiring as necessary. (See para 4-49.)

Step 10. Check operation of mode selector switch (S1).
Test switch. (See para 4-40.) Replace switch, if defective.

Step 11. Check that high or low pressure cut-out switches (S6 and S7) are not open.
PUSH and release TO RESET.



TS4120-377-14/4-T42-2

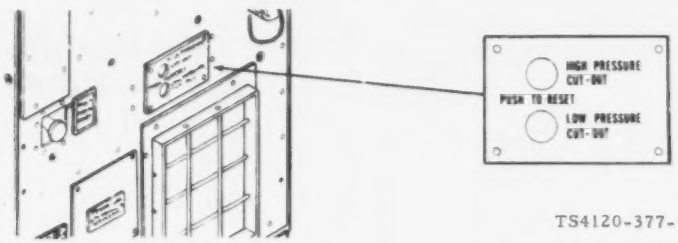
Step 12. Reset (PUSH) PRESSURE CUT-OUT switch(s) and restart unit.
If unit does not start, contact direct support maintenance.

Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

2. CONDITIONED AIR (EVAPORATOR) AND CONDENSER FANS BOTH RUN, BUT COMPRESSOR DOES NOT START AFTER TIME DELAY.

Step 1. Check to see if HIGH or LOW PRESSURE CUT-OUT switch has tripped.
PUSH and release TO RESET.

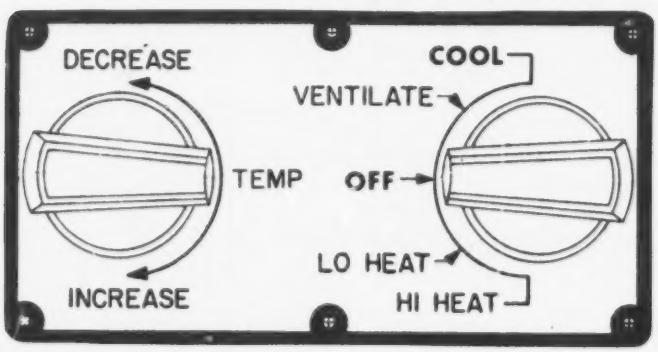


TS4120-377-14/4-T42-3

Step 2. Check operation of mode selector switch.
Turn switch to OFF, the reset to COOL.

NOTE

Allow 30 seconds time delay before compressor starts.



TS4120-377-14/4-T42-4

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be deadly.

Step 3. Check for loose or damaged electrical connectors, or damaged wires in wiring harnesses.
Tighten or replace connectors, or repair damaged wires.

Step 4. Check operation of time delay relay (K3).
Test relay. (See para 4-54.) Replace relay if defective.

Step 5. Check operation of compressor motor relay (K1).
Test relay. (See para 4-55.) Replace relay if defective.

Step 6. Check operation of circuit breaker (CB1) primary contacts.
Test circuit breaker. (See para 4-51.) Replace circuit breaker if defective.

Step 7. Check operation of compressor (B1).
If not operating, contact direct support maintenance.

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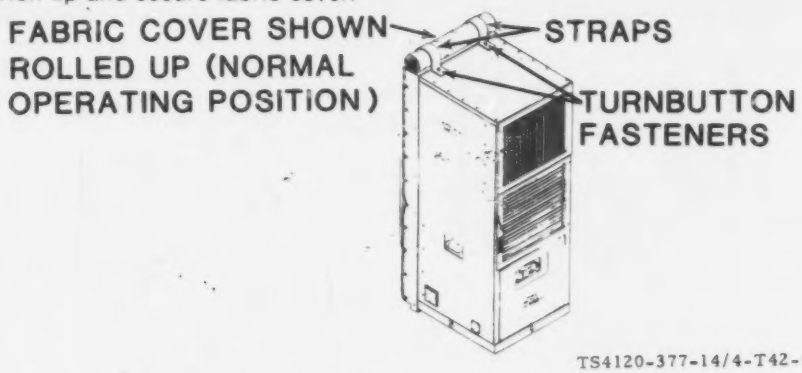
Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

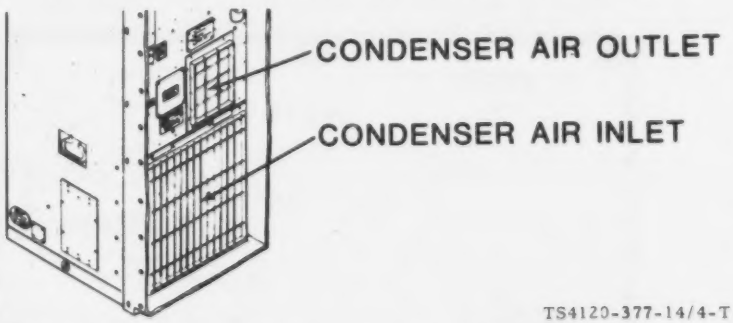
3. COMPRESSOR STARTS NORMALLY, BUT COMPRESSOR CIRCUIT BREAKER SOON TRIPS.

Step 1. Check to be sure fabric cover is rolled up.
Roll up and secure fabric cover.



TS4120-377-14/4-T42-5

Step 2. Check to be sure there is no restriction to air flow through condenser section.
Clean all obstructions from condenser inlet, outlet, and condenser coil.



TS4120-377-14/4-T42-6

Step 3. Check to be sure that condenser fan is operating. (Air being discharged from condenser air outlet.)

NOTE

Condenser fan and conditioned air (evaporator) fan are both driven by the same motor. If one fan is operating and the other is not, check for loose fan on motor shaft. If both fans are not operating, check for loose electrical connections, defective motor relay (K4), or defective motor (B2).

Step 4. Check circuit breaker (CB1).
Test circuit breaker. (See para 4-51.) Replace circuit breaker if defective. Reset compressor circuit breaker and restart in COOL mode.

CAUTION

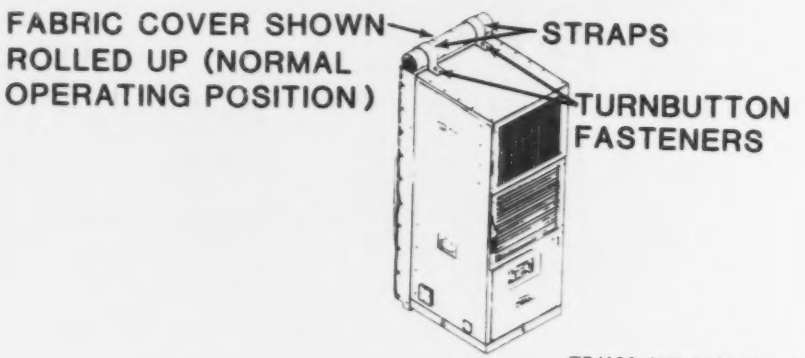
If circut breaker trips again soon after restart in COOL mode, do not attempt another restart, and contact direct support maintenance for refrigeration system troubleshooting.

Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

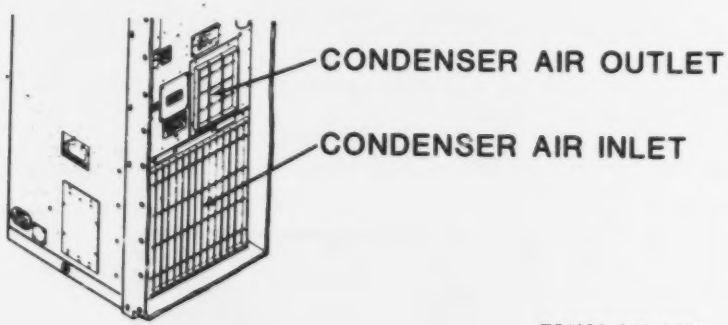
4. COMPRESSOR STARTS NORMALLY, BUT HIGH OR LOW PRESSURE CUT-OUT SWITCH SOON TRIPS.

Step 1. Check to be sure fabric cover is rolled up.
Roll up and secure fabric cover.



TS4120-377-14/4-T42-7

Step 2. Check to be sure there is no restriction to air flow through condenser section.
Clean all obstructions from condenser inlet, outlet, and condenser coil.



TS4120-377-14/4-T42-8

Step 3. Check to be sure that condenser fan is operating. (Air being discharged from condenser air outlet.)

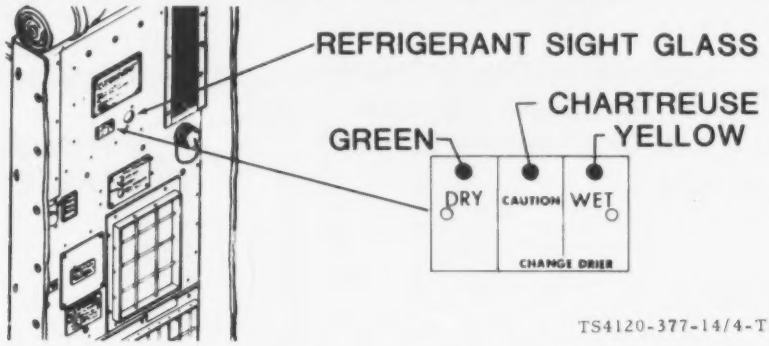
NOTE

Condenser fan and conditioned air (evaporator) fan are both driven by the same motor. If one fan is operating and the other is not, check for loose fan on motor shaft. If both fans are not operating, check for loose electrical connections, defective motor relay (K4), or defective motor (B2).

Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 4. With unit operating in COOL mode, check condition of refrigerant in sight glass.
If indicator color is in the yellow zone or numerous bubbles appear in the window, turn selector switch to OFF and contact direct support maintenance.



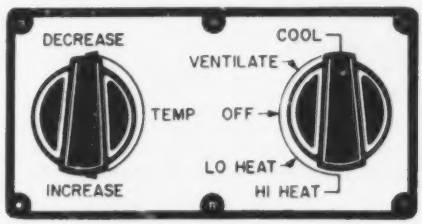
TS4120-377-14/4-T42-9

Step 5. Reset (PUSH) PRESSURE CUT-OUT switch(s) and restart unit.
If unit does not start contact direct support maintenance.

5. REDUCED COOLING CAPACITY.

Step 1. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.

Step 2. Check operation of TEMPerature control thermostat.
Set control at maximum DECREASE; then, if condition improves, adjust properly.



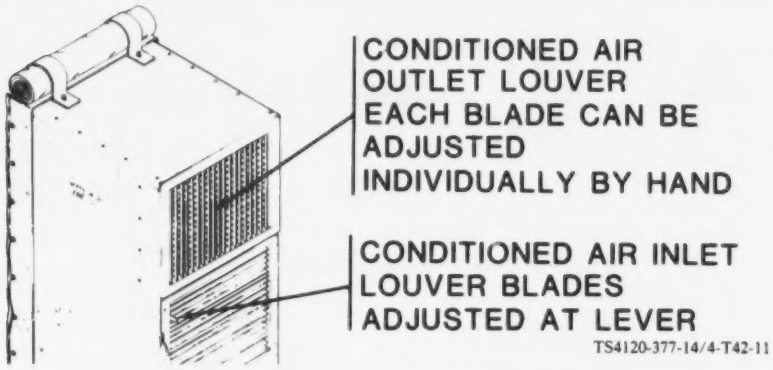
TS4120-377-14/4-T42-10

TABLE 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check that the louvers in the conditioned air inlet and outlet grilles are properly adjusted. (Must be open.)

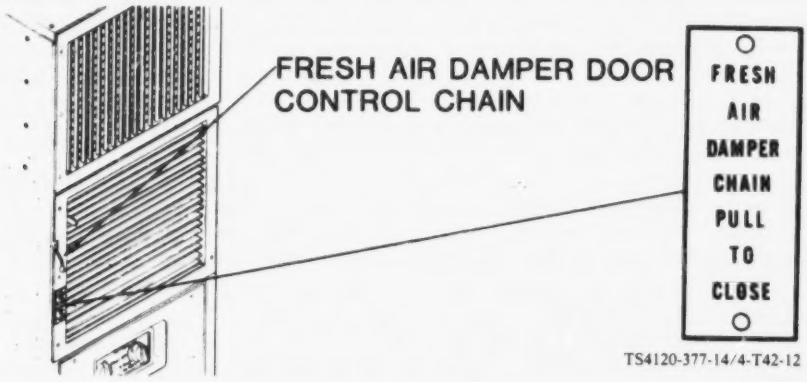
Adjust louvers properly.


CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER

TS4120-377-14/4-T42-11

Step 4. Check to be sure that excessive hot, outside air is not being introduced through the fresh air damper.

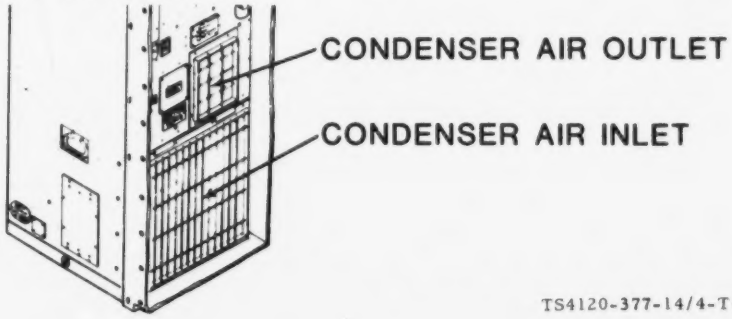
Fully close damper; then, if condition improves, adjust properly.



TS4120-377-14/4-T42-12

Step 5. Check to be sure condenser air inlet and outlet are not obstructed.

Remove obstructions.

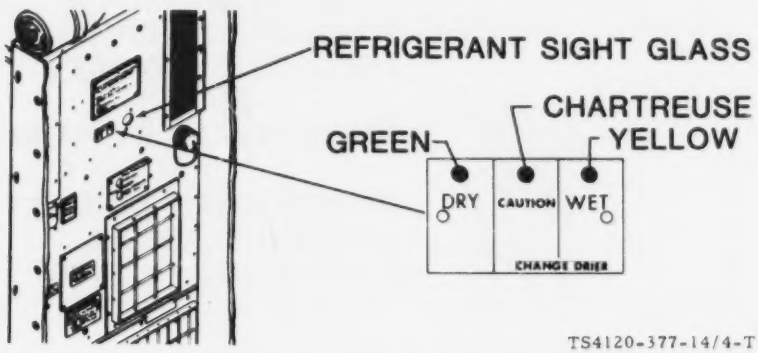


TS4120-377-14/4-T42-13

TABLE 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

Step 6. With unit operating in COOL mode, check condition of refrigerant in sight glass.



TS4120-377-14/4-T42-14

a. If color is yellow or a light hue of chartreuse, or if numerous bubbles appear, turn air conditioner OFF, and contact direct support maintenance for refrigeration system servicing.
b. If color is green or a dark hue of chartreuse, but has a milky appearance, or more than an occasional bubble appears, thoroughly clean the condenser intake screen, condenser fan guard, condenser coil, and entire condenser section to remove all obstructions.
c. Clean and service, or replace mist eliminator. (See para 4-35.)
d. Clean evaporator coil and entire evaporator section. (See para 4-64.)

Step 7. Check air flow out of conditioned air (evaporator) discharge grille. If air flow volume is low:
a. Adjust conditioned air (evaporator) intake grille louvers.
b. Clean and service or replace conditioned air filter element. (See para 4-33.)
c. Clean and service, or replace mist eliminator. (See para 4-35.)
d. Clean evaporator coil and entire evaporator system. (See para 4-64.)

Step 8. Check CBR filter, if installed. (See para 2-21).
Clean, replace, or adjust as indicated.

Step 9. Check operation of TEMPerature control thermostat (S1).
a. Inspect sensing bulb and capillary for damage or leakage. (See para 4-39.) Replace entire control if bulb is damaged or leaking.
b. Test switch in TEMPerature control thermostat. (See para 4-39.) Replace entire control if defective.

TABLE 4-2. TROUBLESHOOTING (Cont.)

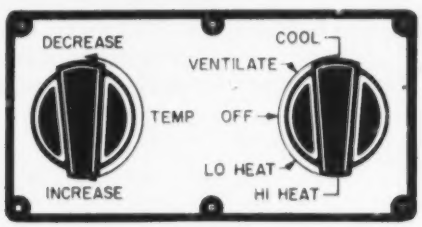
MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. REDUCED HEATING CAPACITY.

Step 1. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.

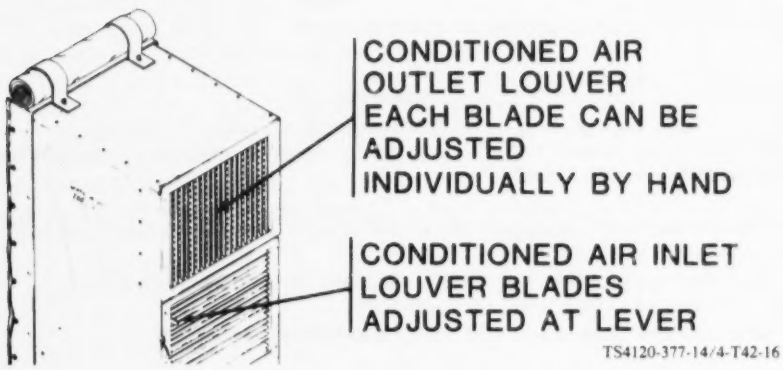
Step 2. If control panel is remotely located, check to be sure that sensing bulb is not near a light bulb or some type of heat producing equipment.
Turn off or move heat source, or move the remote control panel.

Step 3. Check operation of TEMPerature control thermostat.
Set control to fully INCREASE; then, if condition improves, adjust properly.



TS4120-377-14/4-T42-15

Step 4. Check that the louvers in the conditioned air inlet and outlet grilles are properly adjusted.
Adjust louvers properly.

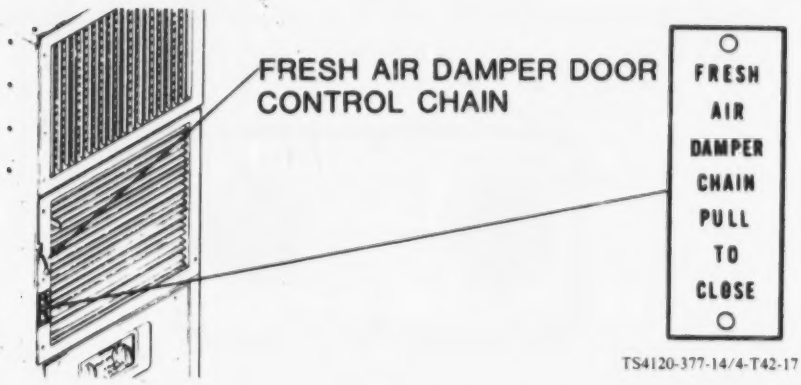

CONDITIONED AIR OUTLET LOUVER EACH BLADE CAN BE ADJUSTED INDIVIDUALLY BY HAND
CONDITIONED AIR INLET LOUVER BLADES ADJUSTED AT LEVER

TS4120-377-14/4-T42-16

TABLE 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

Step 5. Check to be sure that excessive cold, outside air is not being introduced through the fresh air damper.
Fully close damper; then, if condition improves, adjust properly.



TS4120-377-14/4-T42-17

Step 6. Check air flow out of conditioned air (evaporator) discharge grille. If air flow volume is low:
a. Adjust conditioned air (evaporator) intake grille louvers.
b. Clean and service or replace conditioned air filter element. (See para 4-33.)
c. Clean and service or replace mist eliminator. (See para 4-35.)
d. Clean evaporator coil and entire evaporator section. (See para 4-64.)

Step 7. Check for loose or damaged wires and terminals.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be deadly.

Tighten loose or damaged terminals. Repair or replace damaged wires. (See para 4-36.)

Step 8. Check operation of heater thermostat (S4).
Test thermostat. (See para 4-60.) Replace thermostat if defective.

Step 9. Check individual heaters (HR1 through HR6).
Test heaters. (See para 4-61.) Replace defective heaters.

Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
7. NO HEAT IN EITHER HI HEAT OR LO HEAT MODE.	
Step 1. Check for loose or damaged electrical connectors, or damaged wires in wiring harnesses.	
WARNING Disconnect input power before performing internal electrical troubleshooting. Voltages used can be deadly.	
	Tighten or replace loose or damaged connectors or repair damaged wires.
Step 2. Check operation of heater thermostat (S4).	Test thermostat. (See para 4-60.) Replace thermostat if defective.
Step 3. Check operation of mode selector switch (S1).	Test switch. (See para 4-40.) Replace switch if defective.
8. HEAT IN HI HEAT MODE, BUT NOT IN LO HEAT MODE.	
Step 1. Check for loose or damaged electrical connectors, or damaged wires in wiring harnesses.	
WARNING Disconnect input power before performing internal electtical troubleshooting. Voltages used can be deadly.	
	Tighten or replace loose or damaged connectors, or repair damaged wires.
Step 2. Check operation of heater relay (K2).	Test relay. (See para 4-56.) Replace relay if defective.
Step 3. Check operation of TEMPerature control thermostat (S2).	a. Inspect sensing bulb and capillary for damage or leakage. (See para 4-39.) Replace entire control if bulb is damaged or leaking. b. Test switch in TEMPerature control thermostat. (See para 4-39.) Replace entire control, if defective.
Step 4. Check operation of mode selector switch (S1).	Test switch. (See para 4-40.) Replace switch if defective.

Table 4-2. TROUBLESHOOTING (Cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

9. FAN MOTOR (B2) DOES NOT OPERATE.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be deadly.

Step 1. Using wiring diagram (fig. 4-20), check electrical connectors P3 and J3, P9 and J9, P12 and J12, and individual wires for tightness and continuity.
Tighten, repair, or replace as indicated.

Step 2. Check operation of fan motor relay (K4).
Test relay. (See para 4-57.) Replace relay if defective.

Step 3. Check operation of fan motor (B2).
Test motor. (See para 4-63.) Contact direct support maintenance if motor is defective.

Step 4. Check operation of mode selector switch (S1).
Test switch. (See para 4-40.) Replace switch if defective.

10. EXCESSIVE NOISE WHEN COMPRESSOR STARTS.

CAUTION

If a knocking or hammering sound is heard when compressor starts, turn mode selector switch to OFF, immediately. Such noise is usually caused by liquid refrigerant in compressor, which can seriously damage or destroy compressor. Contact direct support maintenance.

11. EXCESSIVELY NOISY OPERATION.

Step 1. Isolate source of noise as near as possible, both by ear and touch.
Listen and feel at both front and back of cabinet.

Step 2. Check fans for looseness or damage, and for rotational clearance.
Tighten loose fans, adjust for rotational clearance, or replace fans. (See para 4-62 and 4-63.)

Step 3. Check all internal components for looseness, vibration, and security.
Tighten, adjust, and secure as necessary.

Section VI MAINTENANCE PROCEDURES

4-17. GENERAL

The procedures in this section have been arranged in the order in which the items appear in the organizational (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by step procedures have been provided for all actions authorized to be performed by organizational maintenance in the order in which they appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been noted; step-by-step procedures for these actions may be found in Chapters 5 and 6 respectively.

WARNING

Panels, covers, screens, grilles, and guards installed on unit are there for a purpose.

Do not operate unit with them off or open unless instructions tell you to. When necessary, do so with care.

4-18. AIR CONDITIONER (FABRIC) COVER

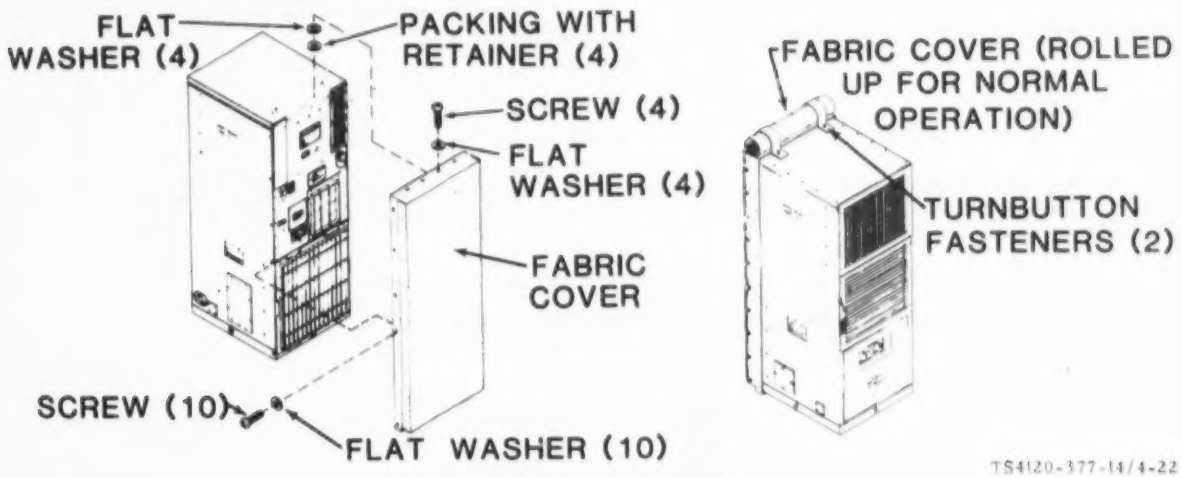


Figure 4-22. Fabric Cover

a. Removal

(1) Roll cover down and secure snap fasteners.

(2) Using screwdriver, remove four screws, eight flat washers, and four packing with retainers from the top.

(3) Using screwdriver, remove ten screws and flat washers from the sides.

(4) Carefully remove the fabric cover.

b. Cleaning

(1) Wipe clean with rag and mild detergent solution.

(2) Thoroughly rinse with fresh water and dry.

c. Lubrication

(1) Snaps may be lubricated with silicone type lubricant or a wax stick.

(2) Turnbutton fasteners may be lubricated with silicone type lubricant or light oil.

d. Inspection/Repair

(1) Inspect for rips, cuts, tears, or punctures in the fabric.

(2) Inspect for damaged, loose, or missing eyelets and snap fasteners.

(3) Refer repair to direct support maintenance.

e. Installation

(1) Aline eyelets to casing mounting holes.

(2) Using screwdriver, secure top of fabric cover with four screws, eight flat washers, and four packing with retainers.

(3) Secure sides with ten screws and flat washers.

(4) If the air conditioner is to be returned to normal operation, open the snap fasteners, roll up the back flap, and secure it with the stowing straps and turnbutton fasteners.

NOTE

If air conditioner installation requires removal of cover, reinstall mounting screws, washers, and packing with retainers. This will protect threads in the casing and prevent air leaks.

4-19. CBR (CHEMICAL, BIOLOGICAL, RADIOLOGICAL) DUCT COVER

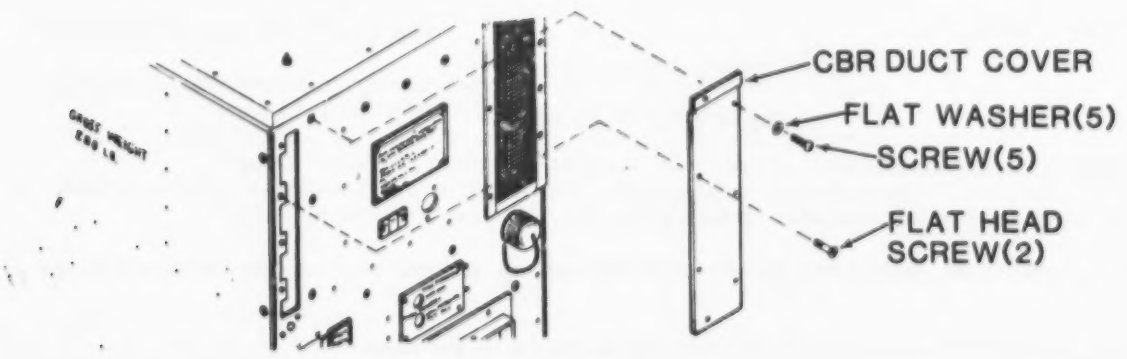


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Figure 4-23. CBR Duct Cover

a. Removal

(1) Using screwdriver, remove five screws and flat washers and two flat head screws.

(2) Remove cover.

b. Inspection

(1) Check that cover is not bent, cracked, or punctured. If damaged, refer to direct support maintenance.

(2) Check that gasket is not torn, loose, or missing. Refer repair/replacement to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

(2) Using screwdriver, secure cover to casing with five screws and flat washers and two flat head screws.

4-20. ACCESS (SERVICE VALVES) COVER

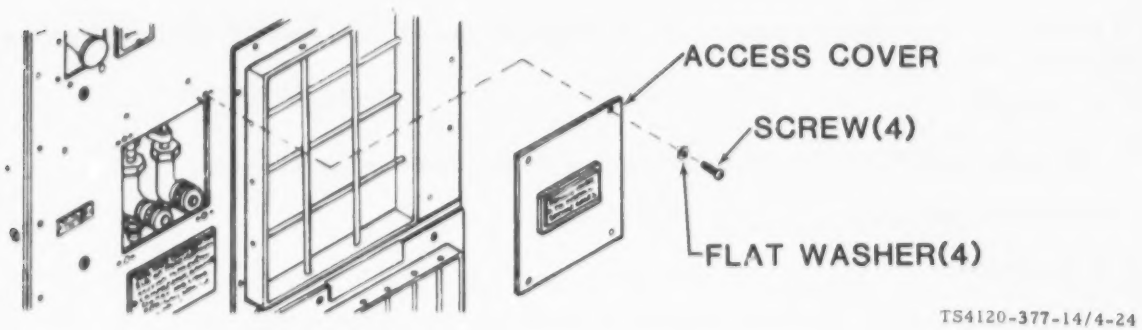


Figure 4-24. Access (Service Valves) Cover

a. Removal

(1) Using screwdriver, remove four screws and flat washers.

(2) Remove cover.

b. Inspection

(1) Check that cover is not bent, cracked, or punctured.

(2) Check that gasket is not torn, loose, or missing.

(3) Check that information plate is readable and in place.

(4) Refer all repairs to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

(2) Using screwdriver, secure cover to casing with four screws and flat washers.

4-21. CONNECTOR COVER PLATES

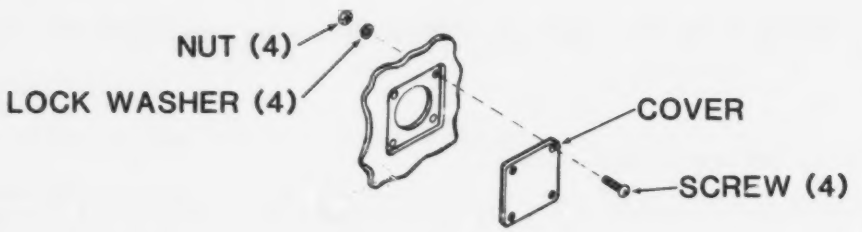


Figure 4-25. Connector Cover Plates

There are four connector cover plates on the air conditioner casing. See installation instructions (para 4-9) for additional information.

a. Removal

(1) Using screwdriver and wrench, remove four screws, lock washers, and nuts.

(2) Remove cover plate (and gasket if applicable.)

b. Inspection

(1) Check that cover is not bent, cracked, or punctured. If damaged, replace cover.

(2) Check that gasket (if applicable) is not torn or otherwise damaged. Replace gasket if damaged.

c. Installation

(1) Aline mounting holes.

(2) Using screwdriver and wrench, install cover plate (and gasket if applicable) with four screws, lock washers, and nuts.

4-22. SIDE ACCESS PLATE COVER

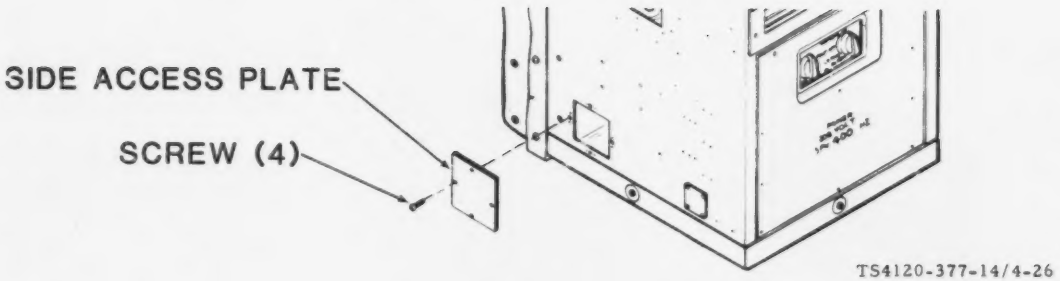


Figure 4-26. Side Access Plate

a. Removal

(1) Using screwdriver, remove four screws.

(2) Remove plate.

b. Inspection

(1) Check that plate is not bent, cracked, or punctured. If plate is damaged, refer to direct support maintenance.

(2) Check that gasket is not torn, loose, or missing. Refer repair/replacement to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

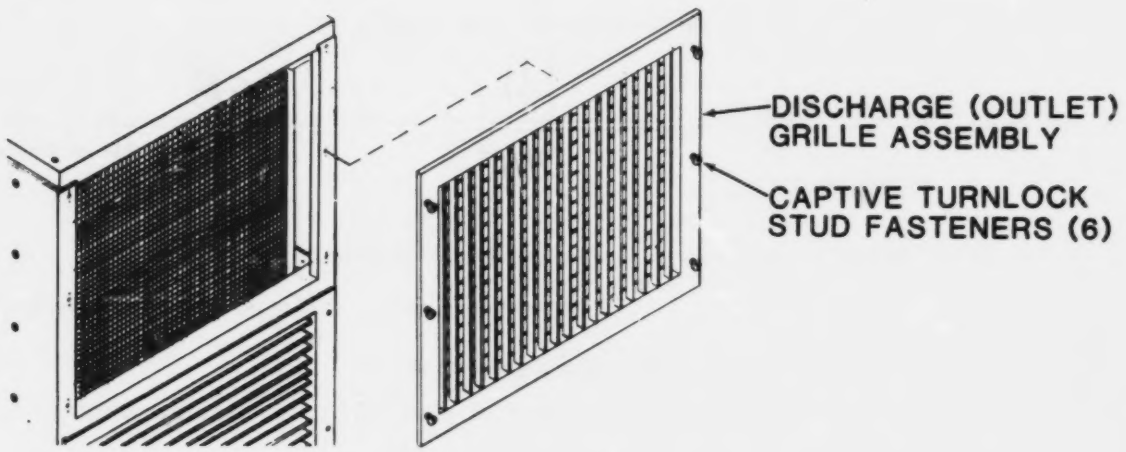
(2) Using screwdriver, secure plate to casing with four screws.

4-23. CONDITIONED AIR DISCHARGE (OUTLET) GRILLE ASSEMBLY

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.



TS4120-377-14/4-27

Figure 4-27. Discharge (Outlet) Grille Assembly

a. Removal

(1) Using screwdriver, loosen six captive turnlock stud fasteners.

(2) Remove grille.

b. Cleaning. Wipe or vacuum all dust and dirt off louvers and inside of grille. Be careful not to damage gasket strips.

c. Inspection/Repair

(1) Inspect each grille for general condition and proper operation.

(2) Bent louvers can usually be straightened with fingers.

(3) Refer requirements for further repair to direct support maintenance.

d. Lubrication

(1) Apply a few drops of light oil to all pivot points of the louvers.

(2) Wipe or blot up all excess oil with a cloth or paper towel.

e. Installation

(1) Aline captive studs with casing fasteners.

(2) Using screwdriver, secure grille with six captive turnlock stud fasteners.

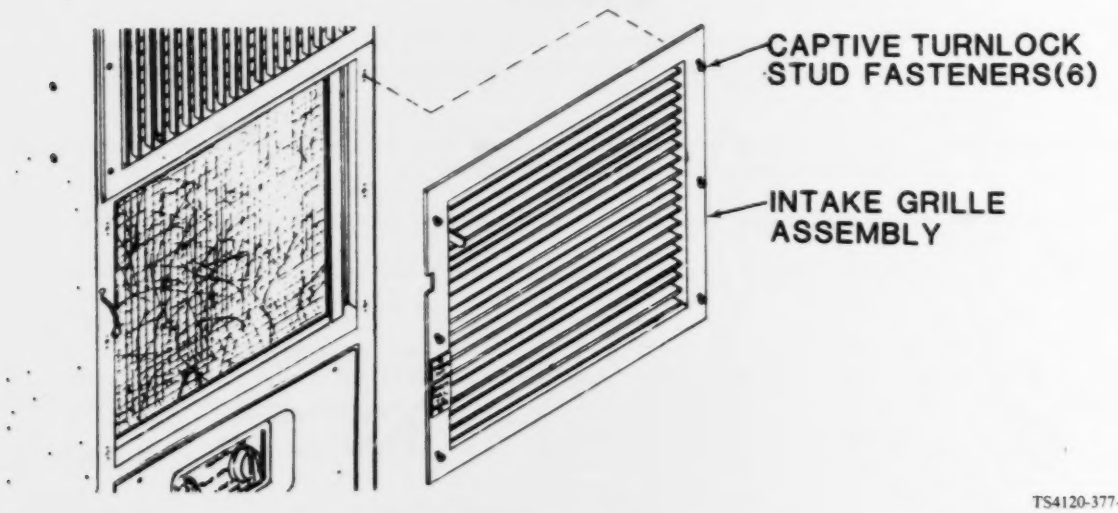
Follow-on procedure: Connect power.

4-24. CONDITIONED AIR INTAKE GRILLE ASSEMBLY

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedures: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.



TS4120-377-14/4-28

Figure 4-28. Intake Grille Assembly

a. Removal

(1) Using screwdriver, loosen six captive turnlock stud fasteners.

(2) Remove grille.

b. Cleaning. Wipe or vacuum all dust and dirt off louvers and inside of grille. Be careful to not damage gasket strips.

c. Inspection/Repair

(1) Inspect each grille for general condition and proper operation.

(2) Bent louvers can usually be straightened with fingers.

(3) Check that information plate is readable and in place.

(4) Refer requirements for further repair to direct support maintenance.

d. Lubrication

(1) Apply a few drops of light oil to all pivot points of the louvers.

(2) Wipe or blot up all excess oil with a cloth or paper towel.

e. Installation

(1) Aline captive studs with casing fasteners.

(2) Using screwdriver, secure grille with six captive turnlock stud fasteners.

Follow-on procedures: Connect power.

4-25. CONDENSER (FAN) GUARD

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

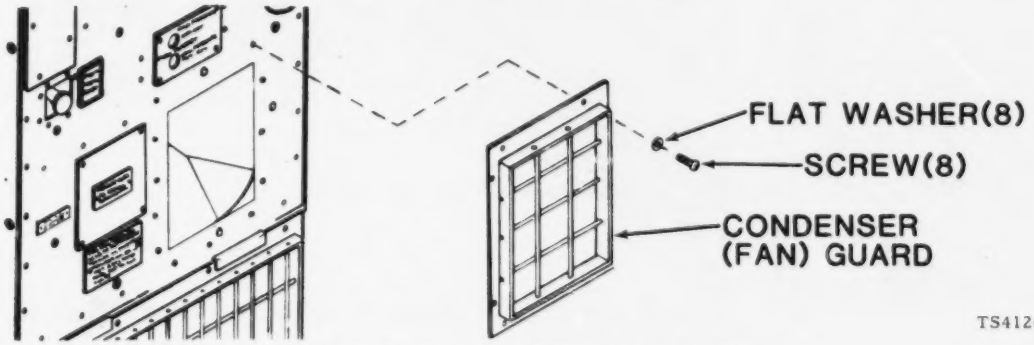


Figure 4-29. Condenser (Fan) Guard

a. Removal

(1) Using screwdriver, remove eight screws and flat washers from guard.

(2) Remove guard.

b. Inspection. Check that guard is not bent or broken. If damaged, refer repair to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

(2) Using screwdriver, secure guard to casing with eight screws and flat washers.

Follow-on procedure: Connect power.

4-26. CONDENSER COIL GUARD

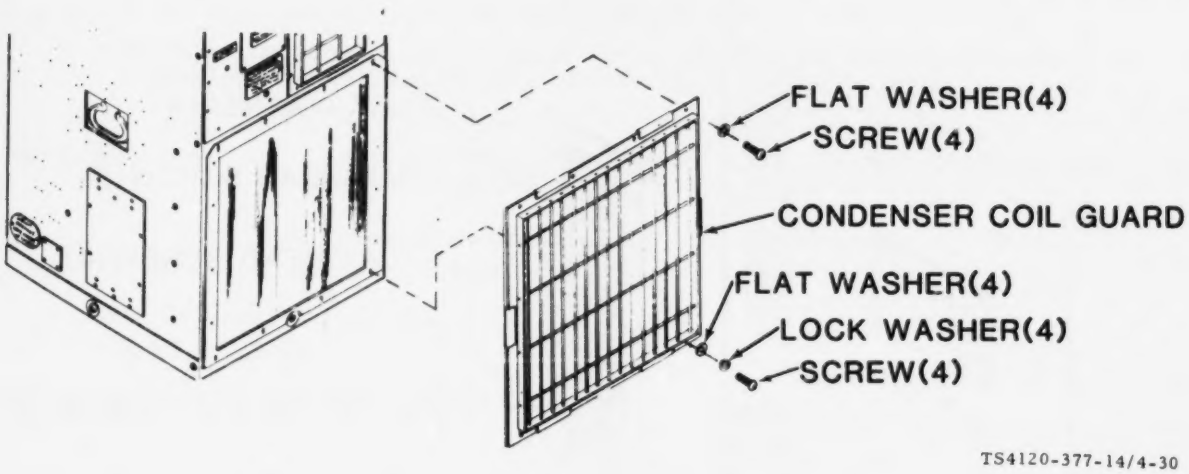


Figure 4-30. Condenser Coil Guard

a. Removal

(1) Using screwdriver, remove four screws, lock washers, and flat washers from lower flange.

(2) Using screwdriver, remove four flat washers and screws from upper flange.

(3) Remove guard.

b. Inspection. Check that guard is not bent, cracked, or otherwise damaged. If damaged, refer repair to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

(2) Using screwdriver, secure guard to casing with four screws and flat washers in top flange and four screws, lock washers, and flat washers in bottom flange.

4-27. FRESH AIR (INLET) SCREEN

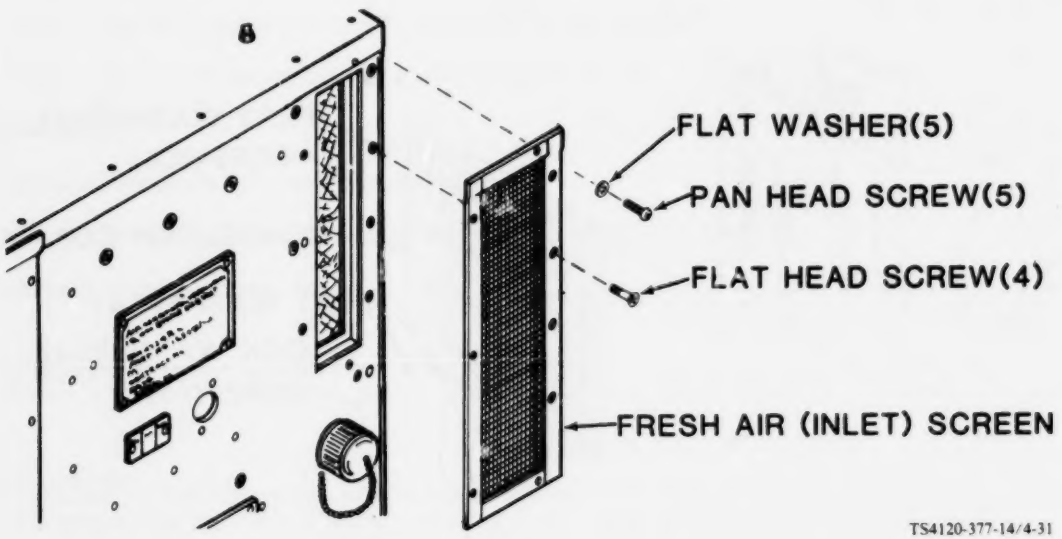


Figure 4-31. Fresh Air (Inlet) Screen

a. Removal

(1) Using screwdriver, remove five pan head screws and flat washers and four flat head screws.

(2) Remove screen.

b. Inspection

(1) Check that screen is not bent, punctured, cracked, or otherwise damaged.

(2) If damaged, refer repair to direct support maintenance.

c. Installation

(1) Aline mounting holes with casing fasteners.

(2) Using screwdriver, secure screen to casing with five pan head screws and flat washers and four flat head screws.

4-28. TOP PANEL

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedures:

1. Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.
2. Remove air conditioner (fabric) cover. (See para 4-18.)

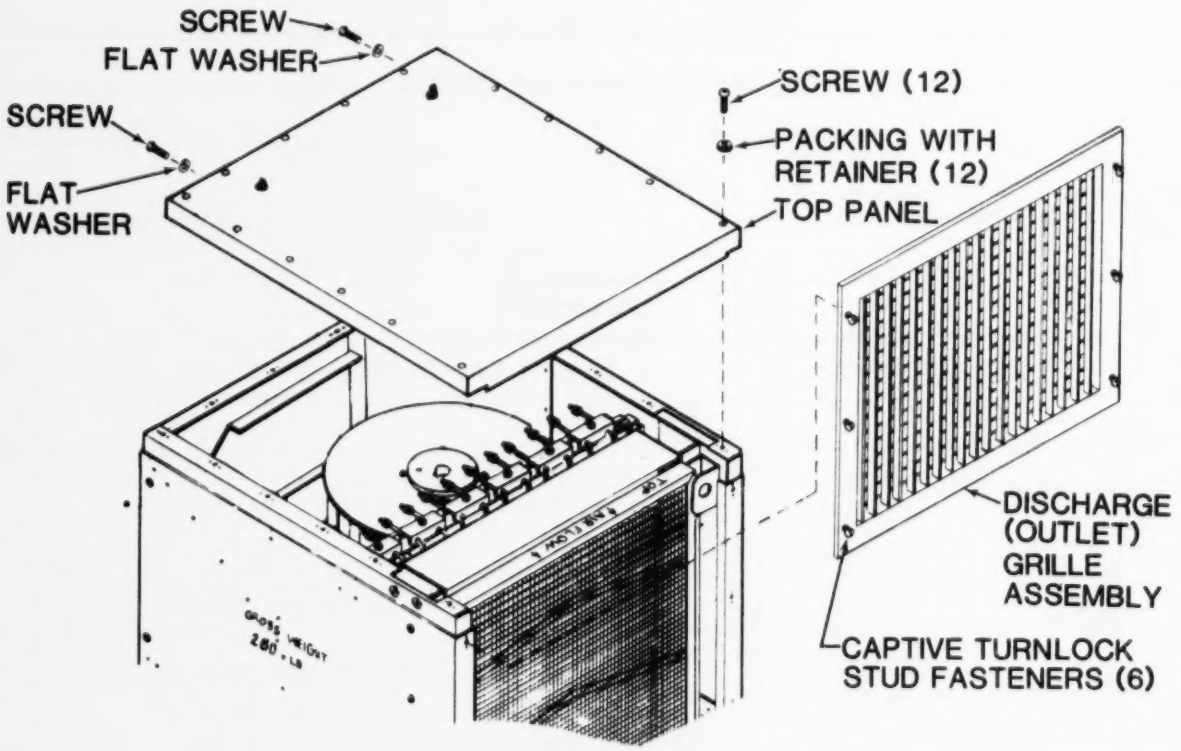


Figure 4-32. Top Panel

a. Removal

(1) Using screwdriver, loosen six captive turnlock stud fasteners in discharge (outlet) grille.

(2) Remove grille.

(3) Using screwdriver, remove two top screws and flat washers from CBR cover and fresh air inlet screen.

(4) Using screwdriver, remove twelve screws and packing with retainers from top panel.

(5) Remove top panel.

b. Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that turnbutton fasteners are in place and in good condition. Replace if missing or damaged.

(3) Check that gaskets and insulation are not torn, loose, or missing.

(4) Refer repairs/replacement of gaskets and insulation to direct support maintenance.

c. Installation

(1) Using screwdriver, secure top panel to casing with twelve screws and packing with retainers.

(2) Using screwdriver, reinstall two top screws and flat washers in CE[illegible] cover and fresh air inlet screen.

(3) Using screwdriver, secure discharge (outlet) grille with six captive turnlock stud fasteners.

Follow-on procedures: 1. Install air conditioner (fabric) cover. (See para 4-18.)

2. Connect power.

4-29. LOWER FRONT PANEL

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

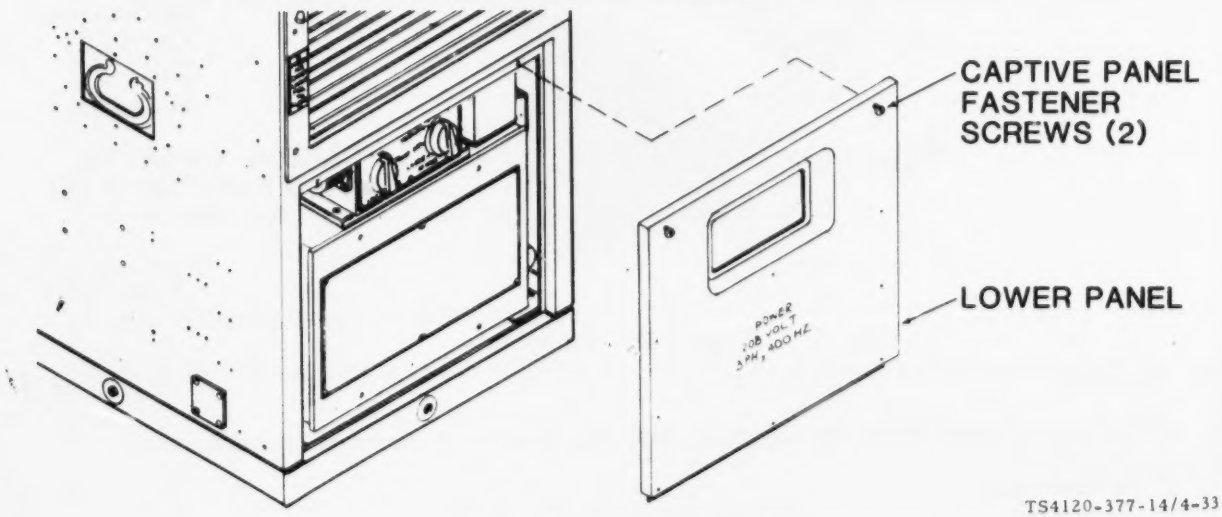


Figure 4-33. Lower Front Panel

a. Removal

(1) Using screwdriver, loosen two captive panel fasteners and remove lower front panel.

(2) Tilt top of lower front panel out and lift panel up to remove.

b. Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that gaskets are not torn, loose, or missing.

(3) Check that wiring diagram plate is readable and in place.

(4) Refer all repairs to direct support maintenance.

c. Installation

(1) Set the bottom of the panel in position so that the flange is inside the lip on the cabinet base.

(2) Push the top of the panel back into position.

(3) Using screwdriver, secure panel to casing with two captive panel fastener screws.

Follow-on procedure: Connect power.

4-30. ACCESS PANEL (CIRCUIT BREAKER)

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

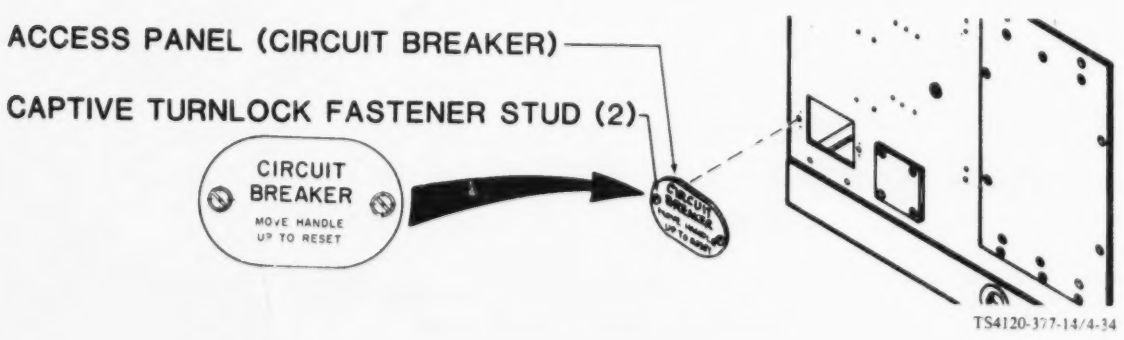


Figure 4-34. Access Panel (Circuit Breaker)

a. Removal

(1) Using screwdriver, loosen two captive turnlock fasteners studs.

(2) Remove access panel.

b. Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that gasket is not torn, loose, or missing.

(3) Check that information is readable.

(4) Refer all repairs to direct support maintenance.

c. Installation

(1) Aline captive studs with casing fasteners.

(2) Using screwdriver, secure access panel with two captive turnlock fastener studs.

Follow-on procedure: Connect power.

4-31. FILTER (RADIO FREQUENCY) MOUNTING PLATE

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

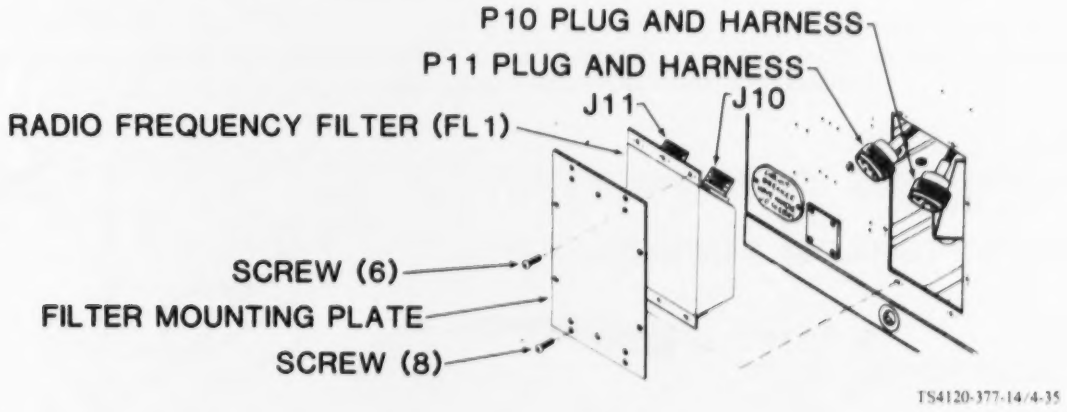


Figure 4-35. Filter Mounting Plate

a. Removal

(1) Using screwdriver, remove eight outermost screws from filter mounting plate.

(2) Slip plate and filter out and support filter.

(3) Using screwdriver, remove six screws from mounting plate and filter.

(4) Remove mounting plate.

b. Inspection. Check that plate is not bent, cracked, or punctured.

c. Installation

(1) Using screwdriver, secure radio frequency filter to mounting plate with six screws.

(2) Using screwdriver, secure mounting plate to casing with eight screws.

Follow-on procedure: Connect power.

4-32. REAR PANEL

Preliminary procedures: 1. Remove top panel. (See para 4-28.)

2. Remove CBR duct cover. (See para 4-19.)

3. Remove access (service valves) cover. (See para 4-20.)

4. Remove condenser (fan) guard. (See para 4-25.)

5. Remove fresh air inlet screen. (See para 4-27.)

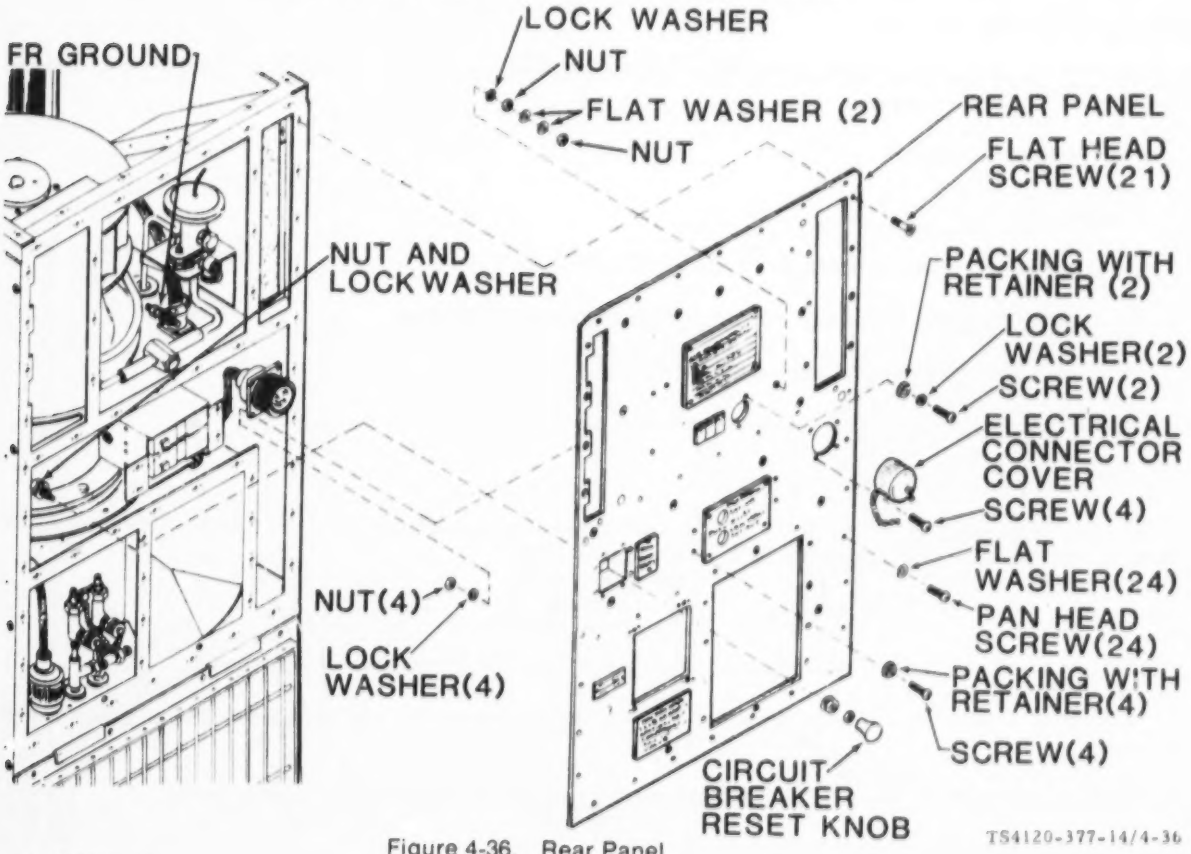


Figure 4-36. Rear Panel

a. Removal

(1) Using screwdriver, remove two screws, lock washers, and packing with retainers from refrigerant sight glass bracket.

(2) Using screwdriver, remove twenty-one flat head screws and twenty-four pan head screws and flat washers from the rear panel.

CAUTION

Take care that wires and refrigerant capillary lines are not damaged.

(3) Carefully pull rear panel out from casing far enough to allow removal of the following items.

(4) Pull circuit breaker knob out to gain access to nut on cable connection.

(5) Using open end wrench to hold smaller nut, twist knob to unscrew from cable end.

(6) Remove knob.

(7) Using wrenches, loosen inner nut and remove nut from outside surface of circuit breaker reset cable end.

(8) Use screwdriver to remove four screws and packing with retainers from pressure cut-out switch enclosure.

(9) Using screwdriver and wrench, remove four screws, lock washers, and nuts to remove the input electrical connector and cover.

(10) Using two wrenches, remove two nuts, two flat washers, and one lock washer and pull ground stud and cable from back side of panel.

(11) Remove rear panel.

b. Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that gasket and insulation are not torn, loose, or missing.

(3) Check that information plates are readable and in place.

(4) Refer all repairs to direct support maintenance.

c. Installation

(1) Using screwdriver and wrench, secure input power harness connector and chain end from connector cover to rear panel with four screws, lock washers, and nuts.

CAUTION

Take care that wires and refrigerant capillary lines are not damaged.

(2) Using screwdriver, secure pressure cut-out switch enclosure with four screws and packing with retainers.

(3) Use wrenches to attach circuit breaker reset cable end to recessed box in rear panel.

- Turn nut all the way back on reset cable shaft.
- Place lock washer on reset cable shaft.
- Insert reset cable shaft through hole in box.

- Place flat washer and sealing nut on to end of reset cable and tighten finger tight.
- Using wrench, tighten nut on back side of box.
- Pull shaft out and place small nut on end of shaft.
- Screw knob onto end of shaft.
- Tighten small nut.

(4) Slip ground stud thru panel and secure with two nuts, two flat washers, and one lock washer.

(5) Using screwdriver, secure back panel with twenty-one flat head screws and twenty-four pan head screws and flat washers.

(6) Using screwdriver, secure refrigerant sight glass bracket with two screws, packing with retainers, and lock washers.

Follow-on procedures:
1. Install top panel. (See para 4-28.)
2. Install fresh air inlet screen. (See para 4-27.)
3. Install condenser (fan) guard. (See para 4-25.)
4. Install access (service valve) cover. (See para 4-20.)
5. Install CBR duct cover. (See para 4-19.)

4-33. CONDITIONED AIR FILTER

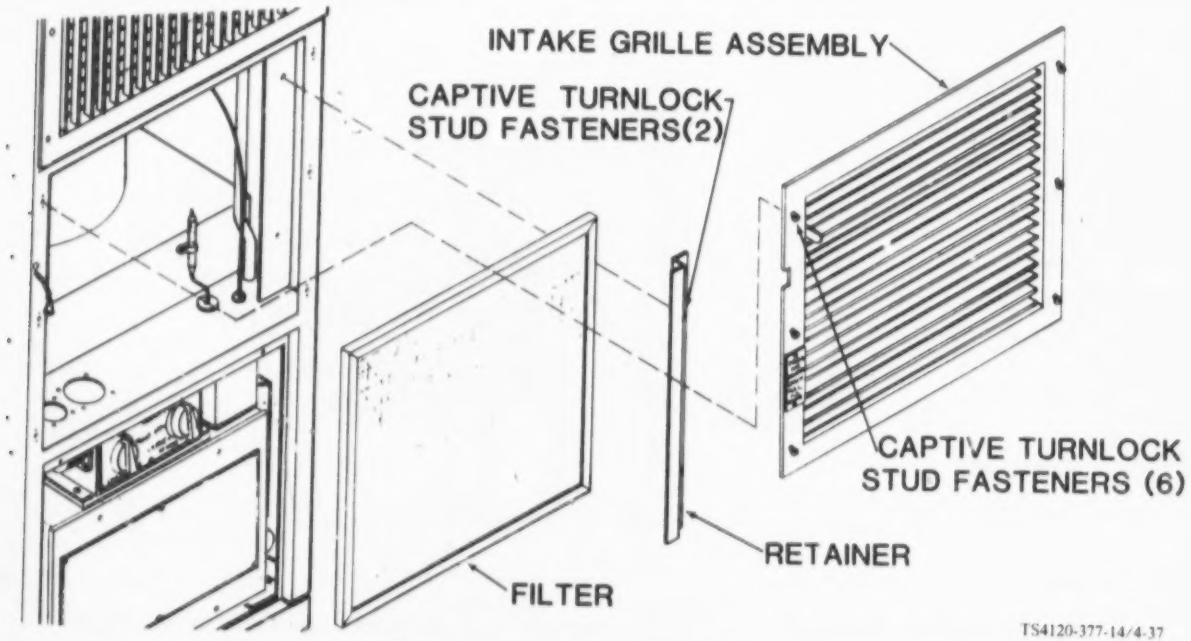


Figure 4-37. Conditioned Air Filter

a. Removal

(1) Using screwdriver, loosen six captive turnlock stud fasteners in intake grille assembly.

(2) Remove grille.

(3) Using screwdriver, loosen two captive turnlock stud fasteners in filter retainer.

(4) Remove retainer and filter.

b. Clean filter

(1) Wash filter in a mild detergent and water solution.

(2) Rinse thoroughly in clean water.

(3) Shake out excess water prior to installation.

c. Inspection.

(1) Check filter for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(2) Check filter for packed or mashed areas that would block air flow.

(3) Replace filter if found bad.

d. Installation

(1) Place filter into retainer on left side. Be sure that air flow arrows are pointing in toward unit.

(2) Using screwdriver, secure filter retainer with two captive turnlock stud fasteners.

(3) Using screwdriver, secure intake grille assembly with six captive turnlock stud fasteners.

4-34. FRESH AIR FILTER

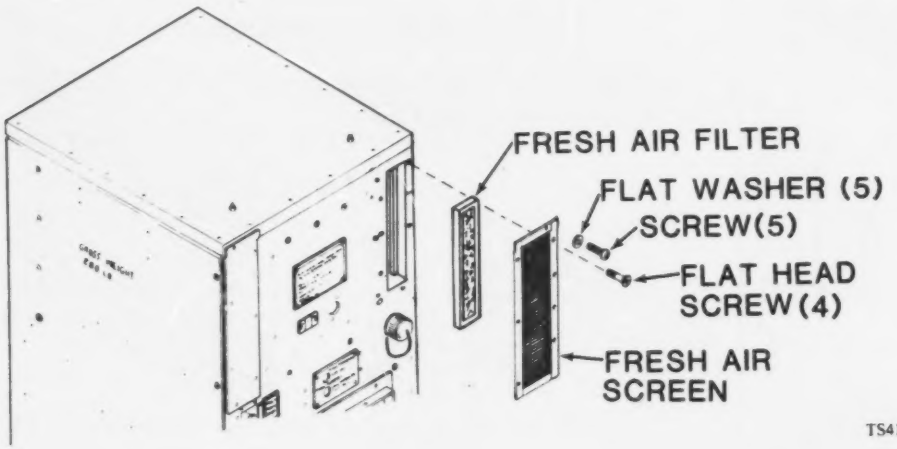


Figure 4-38. Fresh Air Filter

a. Removal

(1) Using screwdriver, remove four flat head screws and five pan head screws and flat washers.

(2) Remove fresh air screen.

(3) Slip filter out of unit.

b. Clean filter

(1) Wash filter in a mild detergent and water solution.

(2) Rinse thoroughly in clear water.

(3) Shake out excess water prior to installation.

c. Inspection

(1) Check filter for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(2) Check filter for packed or mashed areas that would block air flow.

(3) Replace filter if found bad.

d. Installation

(1) Place filter in with UP marking pointing up and directional arrow pointing in toward unit.

(2) Using screwdriver, secure fresh air screen with four flat head screws and five pan head screws and flat washers.

4-35. MIST ELIMINATOR

Preliminary procedure: Remove top panel. (See para 4-28.)

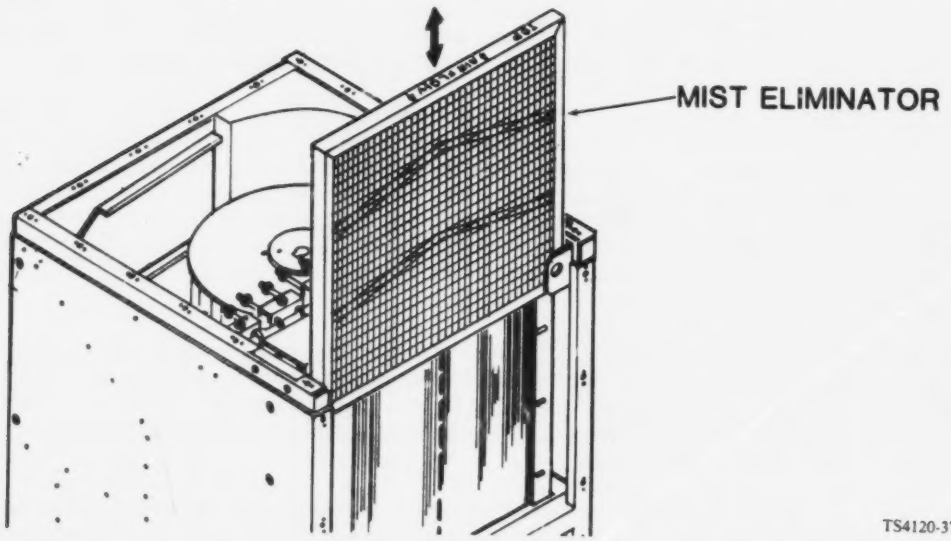


Figure 4-39. Mist Eliminator

a. Removal. Lift mist eliminator straight up and out of guides.

b. Cleaning

(1) Wash in mild detergent and water solution.

(2) Rinse thoroughly in clear water.

(3) Shake out excess water prior to installation.

c. Inspection

(1) Check for punctures, cuts, and other visible damage.

(2) Check for packed or mashed areas that would block air flow.

(3) Replace if found bad.

d. Installation. Slide mist eliminator straight down into guides.

NOTE

Be sure TOP marking is up and air flow arrow points out away from evaporator coil and unit.

Follow-on procedure: Install top panel. (See para 4-28.)

4-36. ELECTRICAL WIRING REPAIR GENERAL

Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make-shift procedures; although the latter may be appropriate for emergency field repairs. Determine the proper size and length of wire, or the terminal, or connector to be used for replacement by referring to table 4-3, "Wire List", and to the wiring diagram (figure 4-20).

a. Soldering connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-F-14256, rosin base flux, item 16, Appendix E, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical solder. If an uncored solder is used, it should be a lead-tin solder, item 2, Appendix E, conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

b. Insulating joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a one-inch length for covering joints at terminals or connectors, or to a length about 1/2 inch (1.3 cm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint, and shrink in place with moderate heat.

c. Splicing wires. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the end to join them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the wire ends, holding the ends parallel and facing opposite directions, then twisting each end around the other wire at least three turns. Solder and apply insulation as described above.

d. Crimping terminals. To install a terminal on the end of a wire, strip 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the end of the wire, apply a one-inch piece of heat-shrink tubing (if the terminals are of the uninsulated type), and insert wire end into the shank of the terminal. Crimp the shank, and install heat-shrink tubing, if necessary.

TABLE 4-3. WIRE LIST

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
		WIRING HARNESS	S4			
S4-4	(97403) 13211E8265	HR5-B	MS25036-108	16	4.0	10.2
S4-5	(97403) 13211E8265	HR4-B	MS25036-108	16	4.0	10.2
S4-6	(97403) 13211E8265	HR4-B	MS25036-108	16	4.0	10.2
		LOOSE WIRE				
S6-1	MS25036-153	S7-2	MS25036-153	16	3.0	7.6
		WIRING HARNESS	J1-P13			
J1-A	MS3100R22-22P	P13-A	MS3106R22-22S	10	36.0	91.4
J1-B	MS3100R22-22P	P13-B	MS3106R22-22S	10	36.0	91.4
J1-C	MS3100R22-22P	P13-C	MS3106R22-22S	10	36.0	91.4
J1-D	MS3100R22-22P	P13-D	MS3106R22-22S	10	36.0	91.4
		WIRING HARNESS	J13-P10			
J13-A	MS3100R22-22P	P10-A	MS3106R22-22S	10	36.0	91.4
J13-B	MS3100R22-22P	P10-B	MS3106R22-22S	10	36.0	91.4
J13-C	MS3100R22-22P	P10-C	MS3106R22-22S	10	36.0	91.4
J13-D	MS3100R22-22P	P10-D	MS3106R22-22S	10	36.0	91.4
		WIRING HARNESS	J3			
J3-A	MS3102R36-7S	TB1-2	MS25036-108	16	13.0	33.0
J3-B	MS3102R36-7S	TB1-3	MS25036-108	16	12.0	30.5
J3-J	MS3102R36-7S	TB2-5	MS25036-106	16	13.0	33.0
J3-w	MS3102R36-7S	CB1-C2	——	12	21.0	53.3
J3-u	MS3102R36-7S	CB1-B2	——	12	21.0	53.3
J3-v	MS3102R36-7S	CB1-A2	——	12	21.0	53.3
J3-G	MS3102R36-7S	TB2-3	MS25036-106	16	8.0	20.3
J3-E	MS3102R36-7S	TB2-2	MS25036-106	16	8.0	20.3
J3-F	MS3102R36-7S	TB2-6	MS25036-106	16	10.0	25.4
J3-H	MS3102R36-7S	TB2-4	MS25036-106	16	9.0	22.9
J3-K	MS3102R36-7S	TB2-6	MS25036-106	16	10.0	25.4
J3-t	MS3102R36-7S	E1	MS25036-112	12	6.0	15.2
J3-1	MS3102R36-7S	TB2-1	MS25036-106	16	8.0	20.3
J3-C	MS3102R36-7S	TB2-5	MS25036-106	16	11.0	27.9
J3-N	MS3106R36-7S	K2-C1	MS25036-108	16	16.0	40.6
J3-M	MS3106R36-7S	K2-B1	MS25036-108	16	18.0	45.7
J3-L	MS3106R36-7S	K2-A1	MS25036-108	16	17.0	43.2
J3-S	MS3106R36-7S	K4-A2	MS25036-108	16	11.0	27.9
J3-T	MS3106R36-7S	K4-B2	MS25036-108	16	10.0	25.4
J3-W	MS3106R36-7S	K4-C2	MS25036-108	16	10.0	25.4
J3-Y	MS3106R36-7S	E1	MS25036-108	16	6.0	15.2
J3-p	MS3106R36-7S	XF1-4	MS25036-153	16	16.0	40.6
J3-d	MS3106R36-7S	TB2-4	MS25036-106	16	11.0	27.9
J3-e	MS3106R36-7S	K2-X2	MS25036-153	16	12.0	30.5
J3-D	MS3106R36-7S	TB2-1	MS25036-106	16	10.0	25.4
J3-f	MS3106R36-7S	XF2-2	MS25036-153	16	17.0	43.2
J3-b	MS3106R36-7S	CB1-NO	(97403) 13216E6192	16	20.0	50.8
J3-y	MS3106R36-7S	TB1-3	MS25036-108	14	12.0	30.5
J3-z	MS3106R36-7S	TB1-2	MS25036-108	14	13.0	33.0
J3-x	MS3106R36-7S	TB1-1	MS25036-108	14	11.0	27.9

TABLE 4-3. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
CB1-C	(97403) 13216E6192	K1-B1	MS25036-108	16	3.0	7.6
CB1-A1	——	K1-A2	MS25036-112	12	12.0	30.5
CB1-B1	——	K1-B2	MS25036-112	12	11.0	27.9
CB1-C1	——	K1-C2	MS25036-112	12	10.0	25.4
TB1-1	MS25036-112	K1-A1	MS25036-112	12	12.0	30.5
TB1-2	MS25036-112	K1-B1	MS25036-112	12	14.0	35.7
TB1-3	MS25036-112	K1-C1	MS25036-112	12	14.0	35.7
TB2-3	MS25036-106	K3-1	——	16	20.0	50.8
TB2-2	MS25036-106	K3-2	——	16	20.0	50.8
TB2-6	MS25036-106	CR1-2	——	16	17.0	43.2
TB2-6	MS25036-106	K1-X1	MS25036-153	16	15.0	38.1
TB2-6	MS25036-106	K4-X1	MS25036-153	16	17.0	43.2
K1-X1	MS25036-153	K2-X1	MS25036-153	16	7.0	17.8
K1-X2	MS25036-153	K3-2	——	16	29.0	73.7
K1-A1	MS25036-108	K4-A1	MS25036-108	16	29.0	73.7
K1-A1	MS25036-112	K2-A2	MS25036-112	12	15.0	38.1
K1-B1	MS25036-112	K2-B2	MS25036-112	12	15.0	38.1
K1-C1	MS25036-112	K2-C2	MS25036-112	12	13.0	30.0
K2-B2	MS25036-108	K4-B1	MS25036-108	16	18.0	45.7
K2-C2	MS25036-108	K4-C1	MS25036-108	16	17.0	43.2
K2-A2	MS25036-108	XF1-1	MS25036-153	16	16.0	40.6
K4-X2	MS25036-153	XF2-2	MS25036-153	16	9.0	22.9
XF1-2	MS25036-153	T1-H2	MS25036-106	16	4.0	10.2
XF1-3	MS25036-153	T1-H1	MS25036-106	16	5.0	12.7
T1-X2	MS25036-106	CR1-1	——	16	7.0	17.8
T1-X1	MS25036-106	CR1-4	——	16	7.0	17.8
CR1-3	——	XF2-1	MS25036-153	16	8.0	20.3
		WIRING HARNESS	P3, P4, P5, P6, P7, and J9			
P3-A	MS3106R36-7P	P4-F	MS3106R20-15S	16	31.0	78.7
P3-B	MS3106R36-7P	P4-G	MS3106R20-15S	16	31.0	78.7
P3-J	MS3106R36-7P	P4-E	MS3106R20-15S	16	31.0	78.7
P3-w	MS3106R36-7P	P4-C	MS3106R20-15S	12	31.0	78.7
P3-u	MS3106R36-7P	P4-B	MS3106R20-15S	12	31.0	78.7
P3-v	MS3106R36-7P	P4-A	MS3106R20-15S	12	31.0	78.7
P3-G	MS3106R36-7P	P4-D	MS3106R20-15S	16	31.0	78.7
P3-E	MS3106R36-7P	P6-A	MS3106R12-3S	16	61.0	154.9
P3-F	MS3106R36-7P	P6-B	MS3106R12-3S	16	61.0	154.9
P3-H	MS3106R36-7P	P5-B	MS3106R12-3S	16	36.0	91.4
P3-K	MS3106R36-7P	P5-A	MS3106R12-3S	16	36.0	91.4
P3-t	MS3106R36-7P	E3	MS25036-157	12	17.0	43.2
P3-l	MS3106R36-7P	J9-N	MS3102R20-27S	16	40.0	101.6
P3-C	MS3106R36-7P	J9-M	MS3102R20-27S	16	40.0	101.6
P3-N	MS3106R36-7P	J9-A	MS3102R20-27S	16	40.0	101.6
P3-M	MS3106R36-7P	J9-B	MS3102R20-27S	16	40.0	101.6
P3-L	MS3106R36-7P	J9-C	MS3102R20-27S	16	40.0	101.6
P3-S	MS3106R36-7P	J9-G	MS3102R20-27S	16	40.0	101.6
P3-T	MS3106R36-7P	J9-H	MS3102R20-27S	16	40.0	101.6
P3-W	MS3106R36-7P	J9-J	MS3102R20-27S	16	40.0	101.6
P3-Y	MS3106R36-7P	P7-A	MS3106R28-11S	16	19.0	48.3
P3-p	MS2106R36-7P	P7-C	MS3106R28-11S	16	19.0	48.3
P3-d	MS3106R36-7P	P7-T	MS3106R28-11S	16	19.0	48.3
P3-e	MS3106R36-7P	P7-N	MS3106R28-11S	16	19.0	48.3
P3-D	MS3106R36-7P	P7-W	MS3106R28-11S	16	19.0	48.3
P3-f	MS3106R36-7P	P7-X	MS3106R28-11S	16	19.0	48.3

TABLE 4-3. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
P3-b	MS3106R36-7P	P7-H	MS3106R28-11S	16	19.0	48.3
P3-y	MS3106R36-7P	P7-K	MS3106R28-11S	14	19.0	48.3
P3-z	MS3106R36-7P	P7-M	MS3106R28-11S	14	19.0	48.3
P3-x	MS3106R36-7P	P7-J	MS3106R28-11S	14	19.0	48.3
P7-D	MS3106R28-11S	J9-E	MS3102R20-27S	16	48.0	121.9
P7-E	MS3106R28-11S	J9-D	MS3102R20-27S	16	48.0	121.9
P7-V	MS3106R28-11S	J9-F	MS3102R20-27S	16	48.0	121.9
E3	MS25036-154	J9-L	MS3102R20-27S	16	51.0	129.5
		WIRING HARNESS	J7			
J7-A	MS3102R28-11P	E2	MS25036-108	16	3.0	7.6
J7-M	MS3102R28-11P	S1-41	——	14	8.0	20.3
J7-X	MS3102R28-11P	S1-11	——	16	10.0	25.4
J7-W	MS3102R28-11P	S1-1D	——	16	10.0	25.4
J7-K	MS3102R28-11P	S1-42	——	14	9.0	22.9
J7-N	MS3102R28-11P	S1-1A	——	16	11.0	27.9
J7-J	MS3102R28-11P	S1-32	——	14	11.0	27.9
J7-T	MS3102R28-11P	S1-1B	——	16	11.0	27.9
J7-C	MS3102R28-11P	S1-2C	——	16	10.0	25.4
J7-V	MS3102R28-11P	S1-3A	——	16	9.0	22.9
J7-E	MS3102R28-11P	S1-4A	——	16	9.0	22.0
J7-D	MS3102R28-11P	S1-4C	——	16	8.0	20.3
J7-H	MS3102R28-11P	S1-21	——	16	10.0	25.4
S1-11	——	S2-R	MS25036-153	16	7.0	17.8
S1-12	——	S2-B	MS25036-153	16	8.0	20.3
		WIRING HARNESS	P8, P9, P12			
P9-A	MS3106R20-27P	P8-C	MS3106R14S-6S	16	25.0	63.5
P9-B	MS3106R20-27P	P8-B	MS3106R14S-6S	16	25.0	63.5
P9-C	MS3106R20-27P	P8-A	MS3106R14S-6S	16	25.0	63.5
P9-D	MS3106R20-27P	P8-E	MS3106R14S-6S	16	25.0	63.5
P9-E	MS3106R20-27P	P8-F	MS3106R14S-6S	16	25.0	63.5
P9-F	MS3106R20-27P	P8-D	MS3106R14S-6S	16	25.0	63.5
P9-G	MS3106R20-27P	P12-A	MS3106R16S-8S	16	18.0	45.7
P9-H	MS3106R20-27P	P12-B	MS3106R16S-8S	16	18.0	45.7
P9-J	MS3106R20-27P	P12-C	MS3106R16S-8S	16	18.0	45.7
P9-M	MS3106R20-27P	S6-2	MS25036-153	16	24.5	62.2
P9-N	MS3106R20-27P	S7-1	MS25036-153	16	24.5	62.2
P9-L	MS3106R20-27P	P12-D	MS3106R16S-8S	12	18.0	45.7
		WIRING HARNESS	P2-P11			
P2-A	MS3106R22-22S	P11-A	MS3106R22-22P	10	30.0	76.2
P2-B	MS3106R22-22S	P11-B	MS3106R22-22P	10	30.0	76.2
P2-C	MS3106R22-22S	P11-C	MS3106R22-22P	10	30.0	76.2
P2-D	MS3106R22-22S	P11-D	MS3106R22-22P	10	30.0	76.2
	WIRING HARNESS		J2			
J2-A	MS3102R22-22P	TB1-1	MS25036-112	10	7.0	17.8
J2-B	MS3102R22-22P	TB1-2	MS25036-112	10	7.0	17.8
J2-C	MS3102R22-22P	TB1-3	MS25036-112	10	8.0	20.3
J2-D	MS3102R22-27P	E1	MS25036-112	10	5.0	12.7

TABLE 4-3. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
		WIRING HARNESS J8				
J8-A	MS3100R14S-6P	HR1-A	MS25036-108	16	35.0	88.9
J8-B	MS3100R14S-6P	HR2-A	MS25036-108	16	32.0	81.1
J8-C	MS3100R14S-6P	HR3-A	MS25036-108	16	29.0	73.2
J8-E	MS3100R14S-6P	HR4-A	MS25036-108	16	27.0	68.6
J8-F	MS3100R14S-6P	HR5-A	MS25036-108	16	25.0	63.5
J8-D	MS3100R14S-6P	HR6-A	MS25036-108	16	21.0	53.3
HR1-B	MS25036-108	HR6-B	MS25036-108	16	17.0	43.2
HR2-B	MS25036-108	HR5-B	MS25036-108	16	10.0	25.4
HR3-B	MS25036-108	HR4-B	MS25036-108	16	5.0	12.7
		GROUND CABLES				
FR-GND	MS25036-157	E4	MS25036-157	12	33.0	83.8
E4	MS25036-157	E3	MS25036-157	12	42.0	106.7

NOTE

TABLE 4-3 above is for KECO Model F18T4-2S
For APPLIED MODEL 3788 make substitutions as follows:

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
		WIRING HARNESS S4				
S4-4	(97403)13211E8265	HR4-B	MS25036-108	16	6.0	15.2
		WIRING HARNESS P8, P9, P12				
P9-M	MS3106R20-27P	S6-2	MS25036-153	16	37.5	95.3
P9-N	MS3106R20-27P	S7-1	MS25036-153	16	37.5	95.3
		WIRING HARNESS J8				
HR3-B	MS25036-108	HR4-B	MS250-36-108	16	7.0	17.8
		GROUND CABLES				
FR-GND	MS25036-157	E4	MS25036-157	12	42.0	106.7
E4	MS25036-157	E3	MS25036-157	12	22.0	55.9

4-37. CONTROL PANEL

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedures: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

NOTE

See paragraph 4-7 for remote mounting of control panel.

a. Removal. (If control panel is remote mounted, see facility or shelter manual.)

(1) Using screwdriver, loosen two captive panel fastener screws in lower front panel.

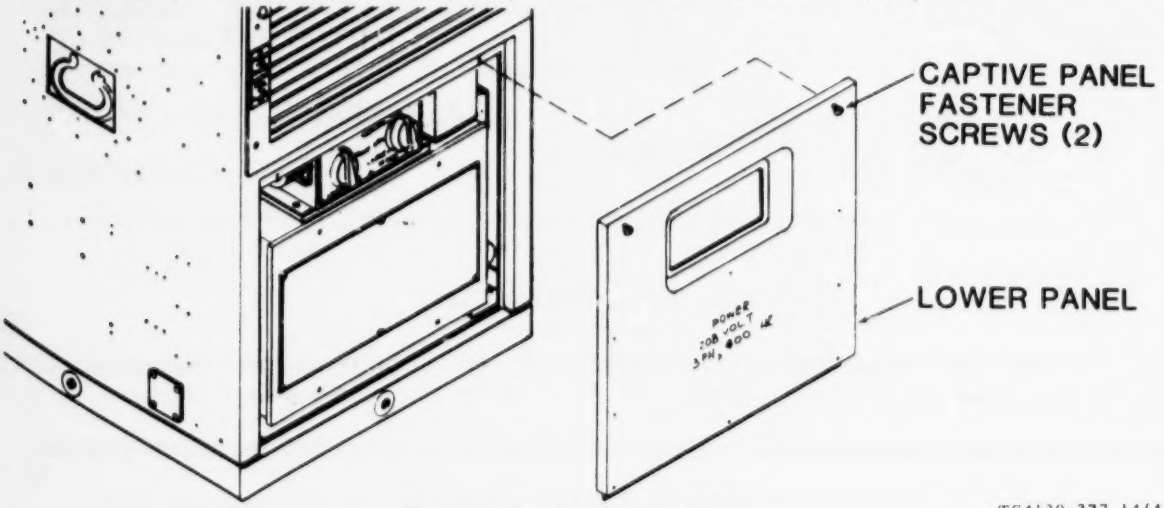


Figure 4-40. Lower Front Panel

TS4120-377-14/4-40

(2) Tip top of lower front panel away from unit and lift panel up to clear flange on bottom of panel.

(3) Using screwdriver, loosen six captive turnlock stud fasteners in intake grille assembly.

(4) Remove grille.

(5) Using screwdriver, loosen two captive stud fasteners in filter retainer.

(6) Remove retainer and filter.

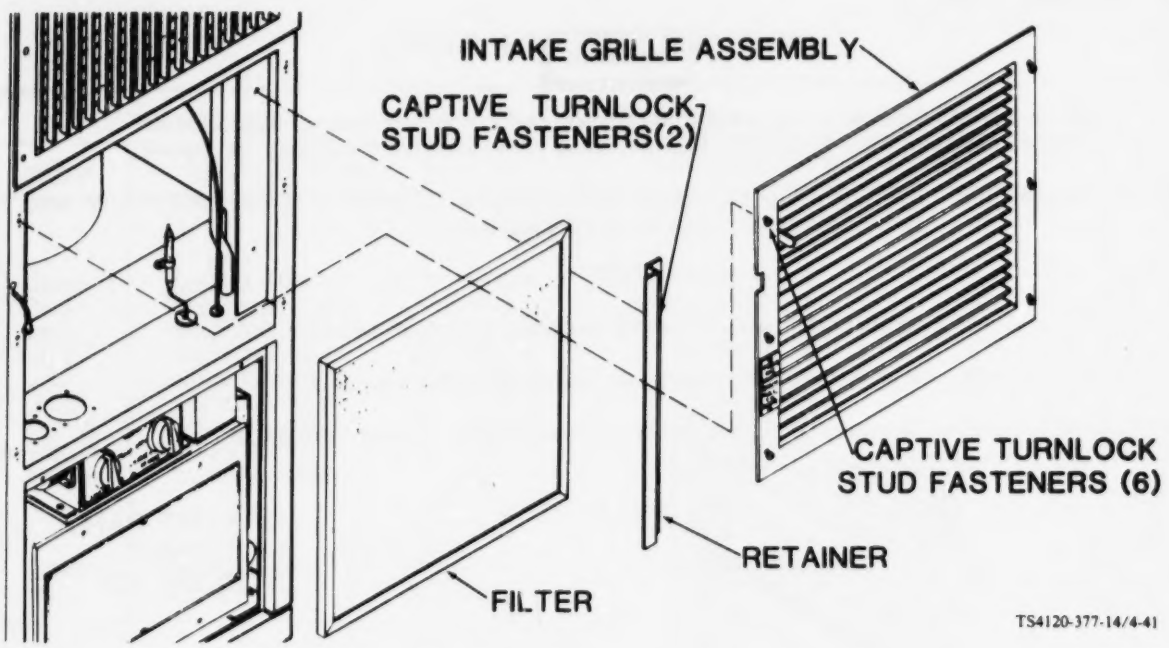


Figure 4-41. Intake Grille and Filter

(7) Using screwdriver, remove screw, lock washer, flat washer, and clamp from remote sensing bulb

(8) Disconnect plug (P7) from receptacle (J7).

(9) Using screwdriver, loosen four captive panel fastener screws in junction box mounting flanges.

(10) Carefully slip junction box out far enough to gain acess to control panel mounting screws.

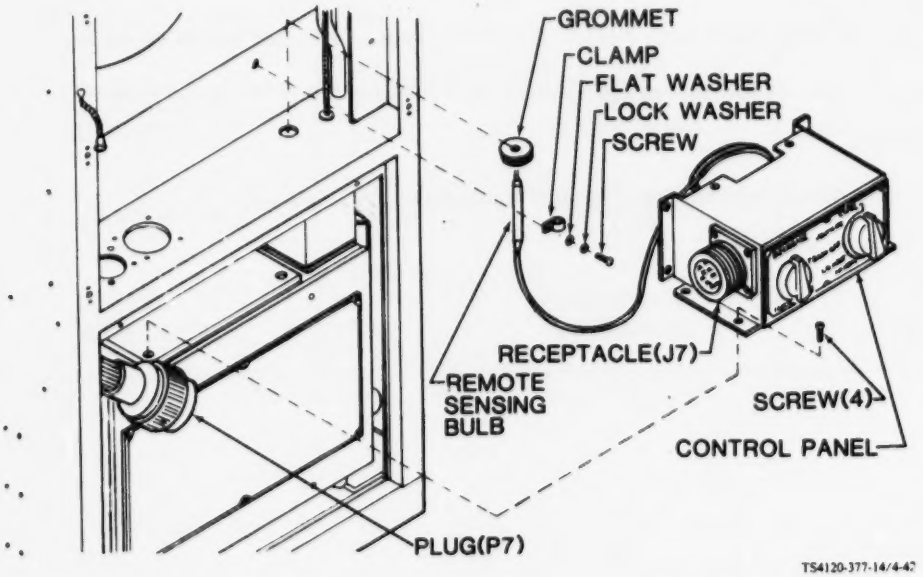


Figure 4-42. Control Panel

(11) Using screwdriver, remove four screws from control box.

(12) Remove grommet from bulkhead.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal.

(13) Carefully slip remote sensing bulb down through bulkhead hole and remove control panel from unit.

b. Test/Replace/Repair. See the following paragraphs for individual component test, replacement, and repair.

(1) Wiring harness. (See para 4-38.)

(2) Temperature control thermostat (S2). (See para 4-39.)

(3) Mode selector (rotary) switch (S1). (See para 4-40.)

(4) Control panel housing. (See para 4-41.)

c. Installation

(1) Using screwdriver, secure control panel to junction box with four screws.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during installation.

(2) Carefully feed sensing bulb and capillary up and into conditioned air intake compartment. (See fig. 4-42.)

(3) Using screwdriver, secure remote sensing bulb with clamp, flat washer, lock washer, and screw.

(4) Install grommet in bulkhead.

(5) Coil excess capillary tubing in recess behind control panel.

(6) Connect P7 plug and harness to receptacle J7 on the control panel.

(7) Carefully move junction box into position and aline mounting hardware.

(8) Using screwdriver, tighten four captive panel screws in junction box mounting flanges.

(9) Using screwdriver, secure filter and filter retainer with two captive turnlock stud fasterners.

(10) Using screwdriver, secure intake grille assembly with six captive turnlock stud fasteners.

(11) Set the bottom of the lower front panel in position so that the flange is inside the lip on the cabinet base.

(12) Push the top of the lower front panel back into position.

(13) Using screwdriver, secure lower front panel to casing with two captive panel fastener screws.

Follow-on procedure: Connect power.

4-38. WIRING HARNESS, CONTROL PANEL

Preliminary procedure: Remove control panel. (See para 4-37.)

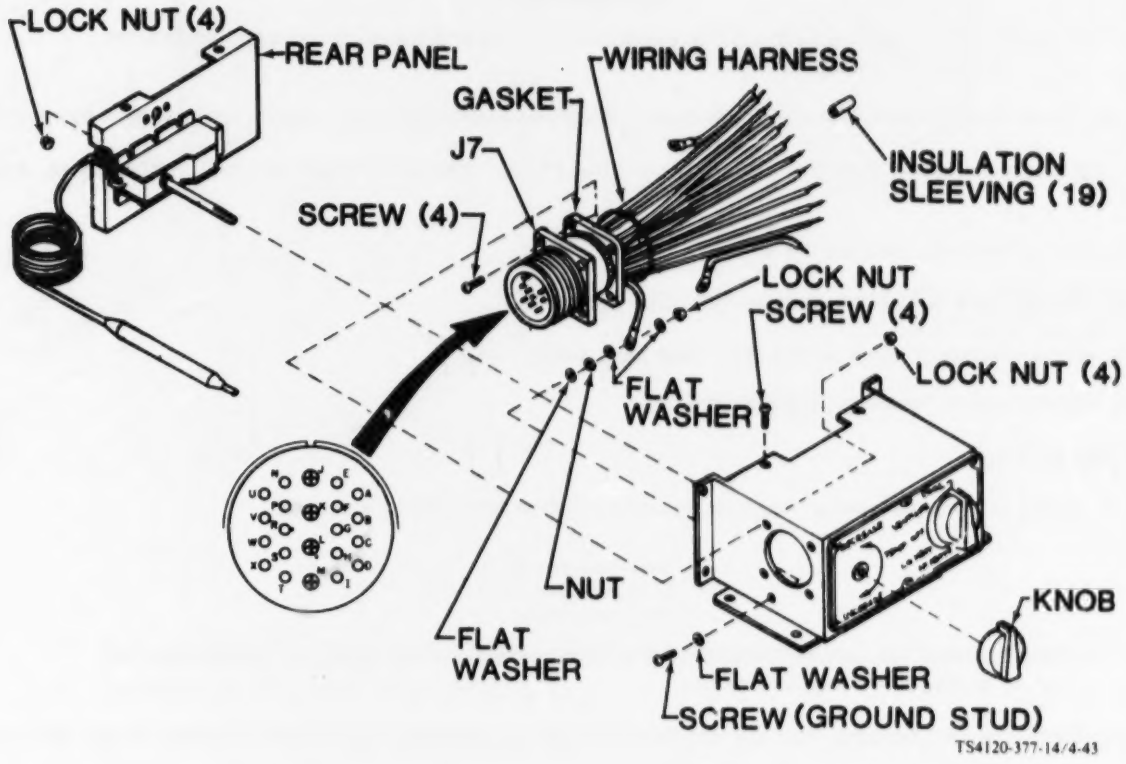


Figure 4-43. Wiring Harness, Control Panel

a. Access

(1) Using allen wrench, loosen TEMPerature control thermostat knob setscrew.

(2) Remove knob.

(3) Using screwdriver and wrench, remove four screws and lock nuts that secure rear panel.

(4) Pull rear panel away from box as far as harness will allow.

b. Inspection/Test

(1) Check connector for general condition and loose, broken, or missing contacts. Replace connector if damaged.

(2) Check individual wires for loose solder connections, terminal lug connections, cut or frayed insulation, and cut or broken wires.

(3) See wiring diagram (fig. 4-20) and continuity test individual wires. Repair or replace wires with no continuity.

c. Removal

(1) Using screwdriver and wrench, remove four screws and nuts from J7 connector.

(2) Using screwdriver and wrench, remove lock nut, lock washer, and flat washer from ground stud.

(3) Tag and disconnect leads from switches.

(4) Remove harness.

d. Repair

(1) See paragraph 4-36 for general wire repair instructions.

(2) See table 4-3 (Wire List) for wire lengths and terminal information when individual wires are replaced.

e. Installation

(1) See tags and wiring diagram (fig. 4-20) and reconnect leads.

(2) Using screwdriver and wrench, secure ground wire to ground stud with flat washer, lock washer, and lock nut.

(3) Remove tags.

(4) Using screwdriver and wrench, secure connector J7 to box with four screws and nuts.

(5) Insert rear panel into box and aline holes.

(6) Using screwdriver and wrench, secure rear panel with four screws and lock nuts.

(7) Place TEMPerature control thermostat knob on shaft and aline setscrew with flat on shaft.

(8) Using allen wrench, tighten setscrews.

Follow-on procedure: Install control panel. (See para 4-37.)

4-39. TEMPERATURE CONTROL THERMOSTAT (S2)

Preliminary procedure: Remove control panel. (See para 4-37.)

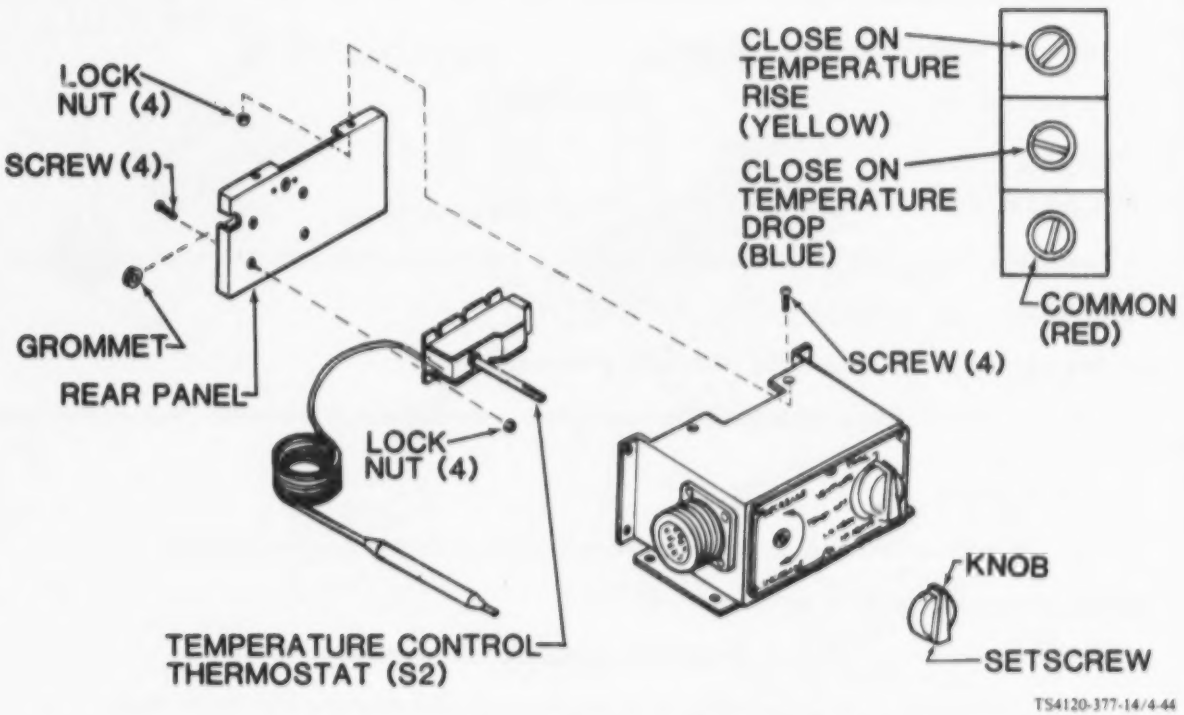


Figure 4-44. Temperature Control Thermostat (S2)

a. Access

(1) Using allen wrench, loosen TEMPerature control thermostat knob setscrew.

(2) Remove knob.

(3) Using screwdriver and wrench, remove four screws and lock nuts that secure rear panel.

(4) Pull rear panel away from box as far as harness will allow.

b. Inspection

(1) Check that leads are properly connected. (See wiring diagram, fig. 4-20.)

(2) Check that capillary line and sensing bulb are not damaged.

(3) Check TEMPerature control thermostat for signs of overheating or other obvious damage. Replace if damaged.

c. Test

(1) Using multimeter, place probes on the red and blue terminals.

(2) Turn TEMPerature control thermostat shaft fully clockwise.

(3) Check continuity. If temperature at sensing bulb is above 40°F (5°C), there should be no continuity.

(4) Slowly turn shaft counterclockwise until continuity is indicated. Turn shaft back and forth slightly to check that switch contacts open and close on a very narrow band.

(5) Place multimeter probes on the red and yellow terminals.

(6) Turn TEMPerature control thermostat shaft fully counterclockwise.

(7) Check continuity. If temperature at sensing bulb is below 90°F (32°C) there should be no continuity.

(8) Slowly turn shaft clockwise until continuity is indicated. Turn shaft back and forth slightly to check that switch contacts open and close on a very narrow band.

(9) Replace TEMPerature control thermostat if it fails any of the above tests.

d. Removal

(1) Tag and disconnect leads.

(2) Using screwdriver and wrench, remove four screws and lock nuts.

(3) Remove TEMPerature control thermostat.

e. Installation

(1) Using screwdriver and wrench, secure TEMPerature control thermostat to rear panel with four screws and lock nuts.

(2) Place capillary line through notch and split grommet in rear panel.

(3) See tags and wiring diagram, figure 4-20, and connect leads.

NOTE

Take care that sensing bulb capillary line is not kinked or mashed.

(4) Insert rear panel into box and aline holes.

(5) Using screwdriver and wrench, secure rear panel with four screws and lock nuts.

(6) Place TEMPerature control thermostat knob on shaft and aline setscrew with flat on shaft.

(7) Using allen wrench, tighten setscrew.

Follow-on procedure: Install control panel. (See para 4-37.)

4-40. MODE SELECTOR (ROTARY) SWITCH (S1)

Preliminary procedure: Remove control panel. (See Para 4-37.)

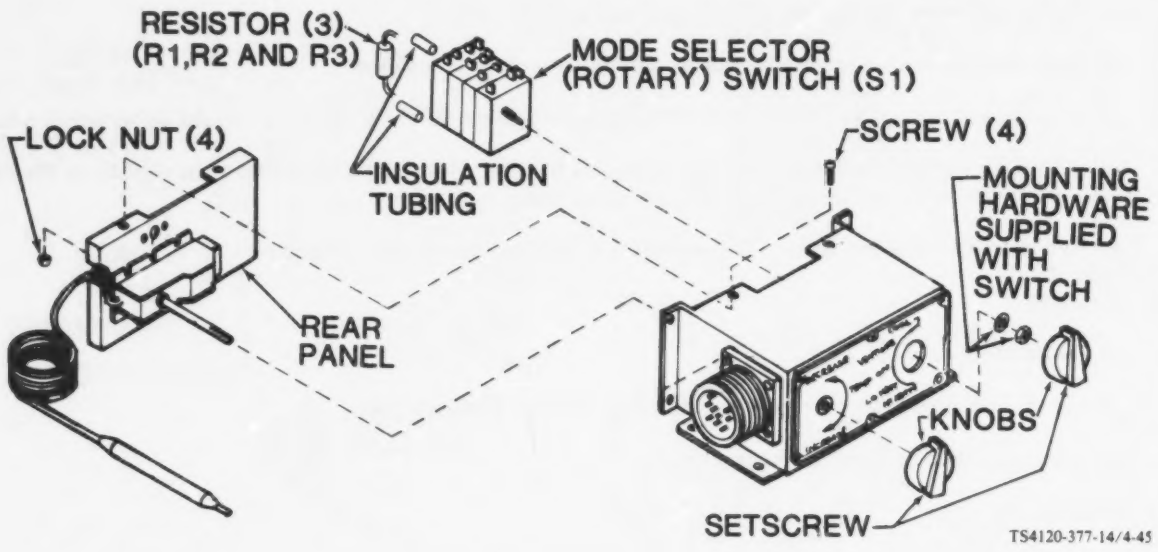


Figure 4-45. Mode Selector (Rotary) Switch (S1)

a. Access

(1) Using allen wrench, loosen setscrews in both knobs.

(2) Remove knobs.

(3) Using screwdriver and wrench, remove four screws and lock nuts that secure rear panel.

(4) Pull rear panel away from box as far as harness will allow.

(5) Using wrench and holding rear of mode selector switch, remove nut and lock washer from the shaft face.

b. Inspection

(1) Check switch to see that all leads and resistors R1, R2 and R3 are properly connected. (See wiring diagram, fig. 4-20.)

(2) Repair or replace all loose or broken leads.

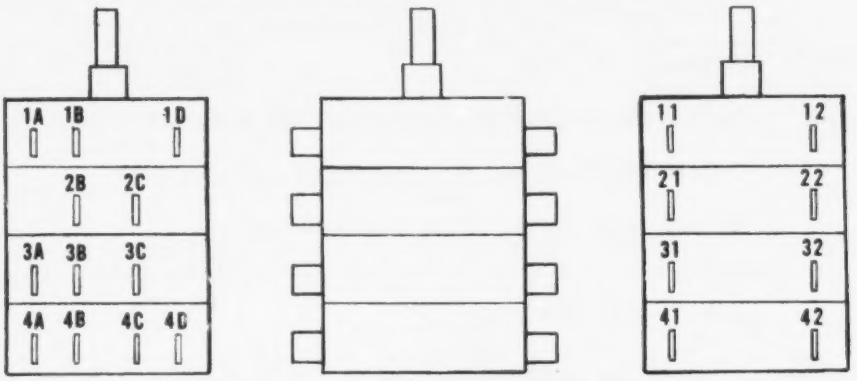
(3) Check that switch terminals are not loose, broken, or corroded.

(4) Check switch for evidence of overheating or other visible damage.

(5) Replace switch if damaged.

c. Test

(1) Using multimeter and switch position chart shown on figure 4-46, check continuity at contacts indicated. With switch position closed, continuity should be indicated. With switch position open, no continuity should be indicated. Check between each set of contacts and at each switch position.



SELECTOR SWITCH S1 POSITION	FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED* **			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C	32 AND 3A	W2 AND WA 41 AND 4C
2	HEAT (LOW)	12 AND 1A	21 AND 2C	*	—
3	OFF	—	—	—	—
4	VENT	—	21 AND 2C	*	—
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C	*	—

* NOT USED
** TEST POINTS

TS4120-377-14/4-46

Figure 4-46. Switch Position and Terminal Identification

(2) Replace switch if it fails above test.

d. Removal. (Assuming switch has been pulled from box for above test.)

(1) Tag and disconnect leads.

(2) Remove switch.

e. Installation

(1) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(2) Slip heat shrinkable tubing over leads.

(3) Solder leads in place using tags and wiring diagram. (See fig. 4-20.)

(4) Slip heat shrinkable tubing over solder connection and shrink in place.

(5) Slip switch into control box and place shaft through hole.

(6) Using wrench and holding backside of switch, secure switch to box with lock washer and nut. Be sure that switch positions match front plate.

(7) Insert rear panel into box and aline holes.

(8) Using screwdriver and wrench, secure rear panel with four screws and lock nuts.

(9) Place knobs on switch shafts and aline setscrews with flats on shafts.

(10) Using allen wrench, tighten setscrews in both knobs.

Follow-on procedure: Install control panel. (See para 4-37.)

4-41. CONTROL PANEL HOUSING

Preliminary procedures: 1. Remove control panel wiring harness. (See para 4-38.)

2. Remove TEMPerature control thermostat. (See para 4-39.)

3. Remove mode selector switch. (See para 4-40.)

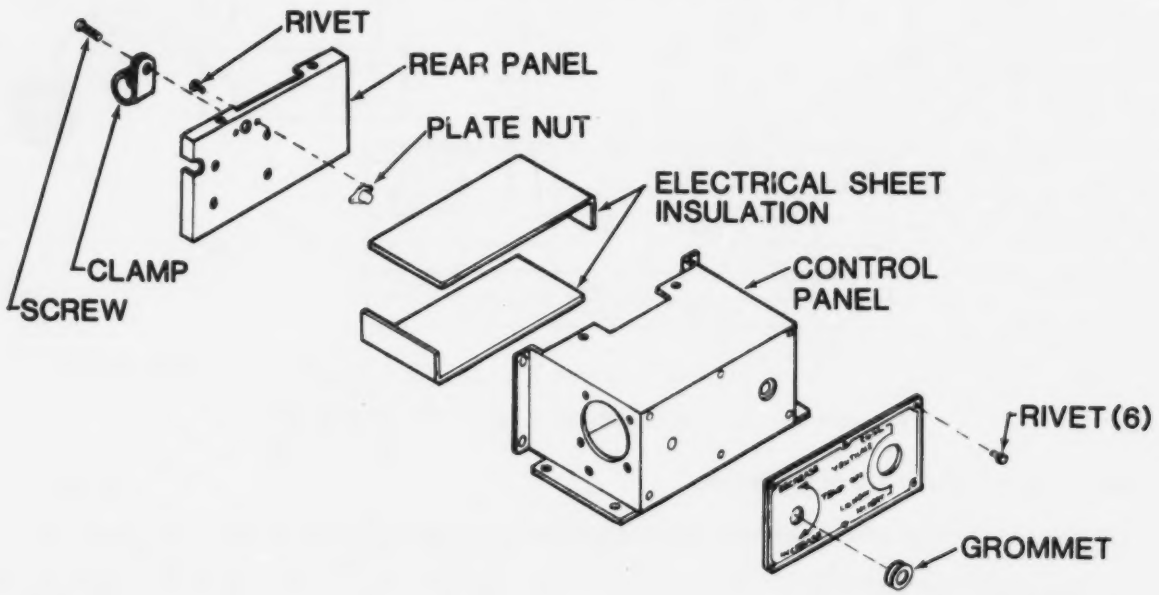


Figure 4-47. Control Panel Housing

a. Inspection

(1) Check control panel for dents, cracks, or punctures. Replace if damage creates a hazard or interferes with operation.

(2) Check that insulation, plate nut, clamp, and grommets are in place and secure. Repair or replace as needed.

(3) Check that information plate is legible and securely riveted to control panel.

(4) Check support for cracks or dents that create a hazard or interfere with operation.

b. Repair

(1) Repairs are limited to replacement of damaged or missing parts and tightening of mounting hardware.

(2) Refer replacement of information plate to direct support maintenance.

Follow-on procedures: 1. Install mode selector switch. (See para 4-40.)

2. Install TEMPerature control thermostat. (See para 4-39.)

3. Install control panel wiring harness. (See para 4-38.)

4-42. BLOCK OFF ASSEMBLY

This part is supplied only when specified on air conditioner ordering information.

NOTE

This paragraph is applicable only to units with remote mounted control panels. See paragraph 4-7, installation instructions, and your facility or shelter manual.

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedures: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

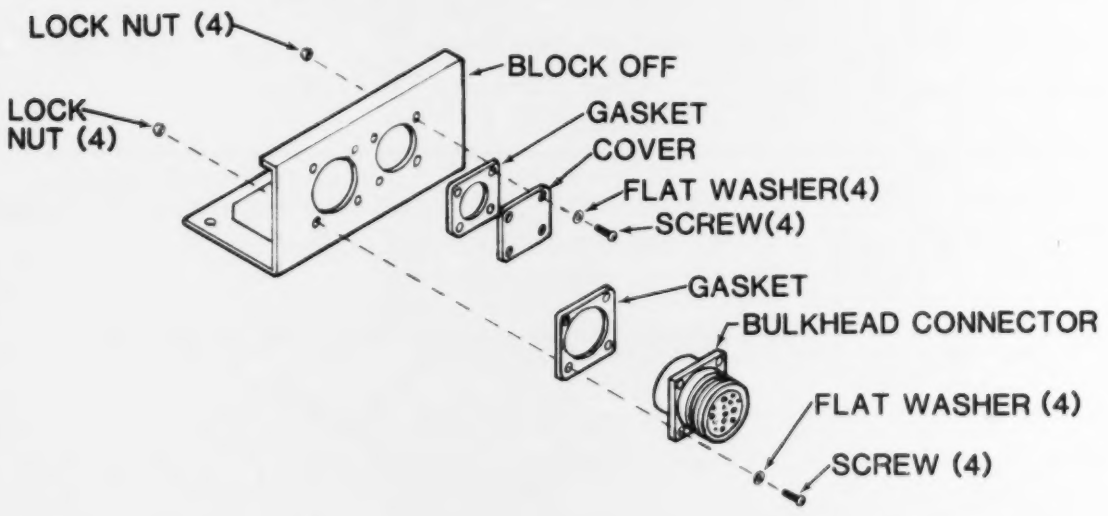


Figure 4-48. Block Off Assembly Prior to Installation

a. Removal

(1) Remove lower front panel. (See para 4-29.)

(2) If the P7 plug is connected at the bulkhead connector, disconnect it.

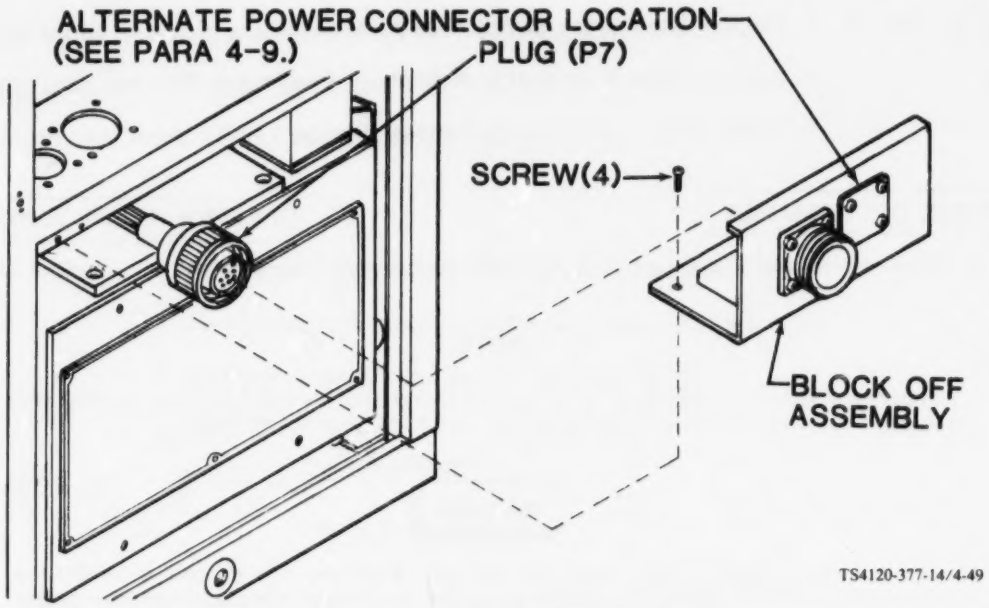


Figure 4-49. Block Off Assembly Installed

(3) Pull connector from block off.

(4) If alternate location for power connector was used, remove the connector.

(5) Using screwdriver, remove four screws from lower flanges.

(6) Remove block off assembly.

b. Inspection

(1) Check block off for missing parts, loose hardware, and cracks or dents that would create a hazard or interfere with operation.

NOTE

If alternate power and control connector locations in conditioned air intake are used, both cover plates should be installed on block off.

(2) Replace all missing or damaged parts.

c. Repair. Repairs are limited to replacement of missing or damaged parts.

d. Installation. (See installation instructions paragraph 4-7.)

(1) If applicable, connect the P7 plug and harness.

(2) If applicable install power connector.

(3) Using screwdriver, secure block off to air conditioner with four screws.

(4) Install lower front panel. (See para 4-29.)

Follow-on procedure: Connect power.

4-43. WIRING HARNESSES

Preliminary procedures: (UPPER SECTION) Remove top panel. (See para 4-28.)

(CENTER SECTION) Remove rear panel. (See para 4-32.)

(LOWER SECTION) Remove lower front panel. (See para 4-29.)

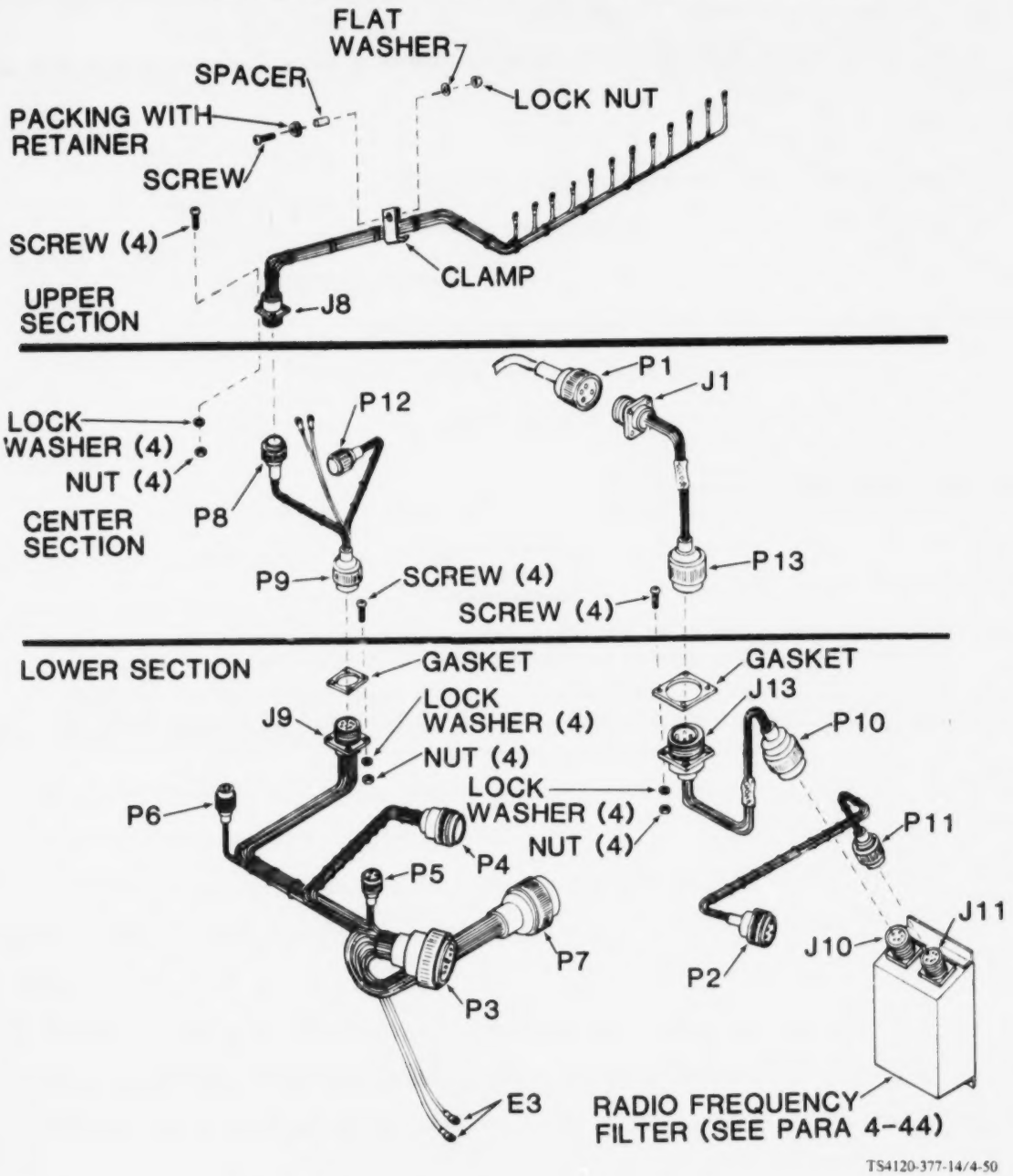


Figure 4-50. Wiring Harnesses

a. Inspection/Test

(1) Check to be sure that power has been disconnected.

(2) Check connectors for general condition and loose, broken, or missing contacts. Replace damaged connectors.

(3) Check individual wires for loose solder connections, loose terminal lug connections, cut or frayed insulation, and cut or broken wires.

(4) See wiring diagram (fig. 4-20) and continuity test individual wires. Repair or replace wires with no continuity.

b. Repair

(1) See paragraph 4-36 for general wire repair instructions.

(2) See table 4-3 (Wire List) for wire lengths and terminal/connector information.

c. Removal/Installation. See figure 4-50 for removal/installation information.

Follow-on procedures: 1. Install lower front panel. (See para 4-29.)

2. Install rear panel. (See para 4-32.)

3. Install top panel. (See para 4-28.)

4-44. RADIO FREQUENCY FILTER (FL1)

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

Preliminary procedure: Turn unit power off at power source. If there is a chance that it will be turned on, also disconnect power cable to air conditioner.

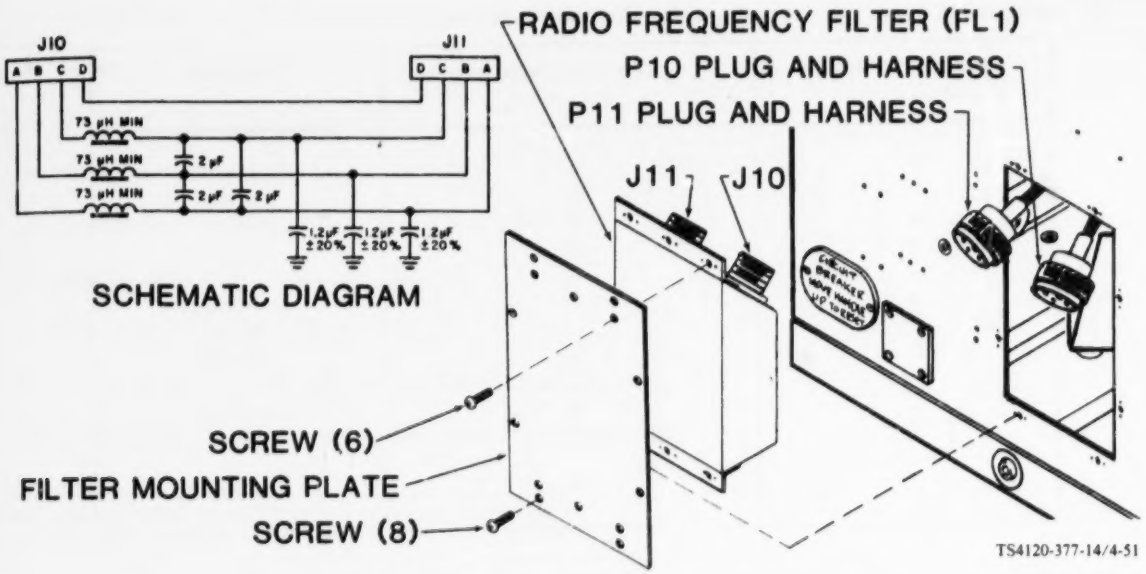


Figure 4-51. Radio Frequency Filter (FL1)

a. Removal

(1) Using screwdriver, remove eight, outermost, screws from filter mounting plate.

(2) Slip plate and filter out and support filter.

WARNING

Capacitors can retain a high electrical charge. Touching terminals of a charged capacitor can result in severe electrical shock and skin burns. Always ground terminals of a capacitor as soon as they are exposed.

(3) Disconnect the P10 and P11 plugs from the radio frequency filter.

(4) Discharge filter capacitors at connector, (J10).

(5) Using screwdriver, remove six screws from mounting plate and filter.

(6) Separate filter mounting plate and radio frequency filter.

b. Inspection/Test

(1) Check radio frequency filter for dents, punctures, and evidence of overheating.

(2) Check connectors J10 and J11 for loose, missing, or broken contacts.

(3) Replace filter if badly dented, punctured, burnt, or connectors have loose, missing, or broken contacts.

(4) Using multimeter, check continuity between J11 contacts A, B, and C to filter case. If continuity is indicated, replace filter.

(5) Using multimeter, check continuity as shown in following table.

From receptacle J10, pin	To receptacle J11, pin	Indication
A	A	Continuity
A	B	None
A	C	None
A	D	None
B	B	Continuity
B	C	None
B	D	None
C	C	Continuity
C	D	None
D	D	Continuity

(6) If filter does not meet continuity requirements, replace it.

NOTE

Continuity testing does not necessarily predict the behavior of capacitors under load. If the filter still does not operate properly after passing the continuity test, substitute a filter known to be good.

c. Installation

(1) Using screwdriver, secure filter to mounting plate with six screws.

(2) Connect P10 plug and harness to J10 connector on filter.

(3) Connect P11 plug and harness to J11 connector on filter.

(4) Using screwdriver, secure mounting plate to casing with eight screws.

Follow-on procedure: Connect power.

4-45. JUNCTION BOX

This junction box is the protective enclosure that contains the compressor circuit breaker (CB1), relays (K1, K2, and K4), time delay relay (K3), fuses (F1, F2 and F3), rectifier (CR1), and terminal blocks (TB1 and TB2). The transformer is mounted on the outside top of the box. See the following paragraphs for maintenance of junction box parts.

- Junction box removal/installation. (See para 4-46.)
- Junction box access to internal components. (See para 4-47.)
- Circuit breaker external reset control. (See para 4-48.)
- Junction box harnesses. (See para 4-49.)
- Transformer (T1). (See para 4-50.)

- Compressor circuit breaker (CB1). (See para 4-51.)
- Fuses (F1, F2, and F3). (See para 4-52.)
- Rectifier (CR1). (See para 4-53.)
- Time delay relay (K3). (See para 4-54.)
- Compressor start relay (K1). (See para 4-55.)
- Heater relay (K2). (See para 4-56.)
- Fan motor relay (K4). (See para 4-57.)
- Terminal boards (TB1 and TB2). (See para 4-58.)
- Junction box housing, panel, and cover. (See para 4-59.)

4-46. JUNCTION BOX REMOVAL/INSTALLATION

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

a. Removal

(1) Turn power off at power source.

(2) Disconnect power cable at air conditioner.

(3) Using screwdriver, loosen two captive panel fastener screws in lower front panel.

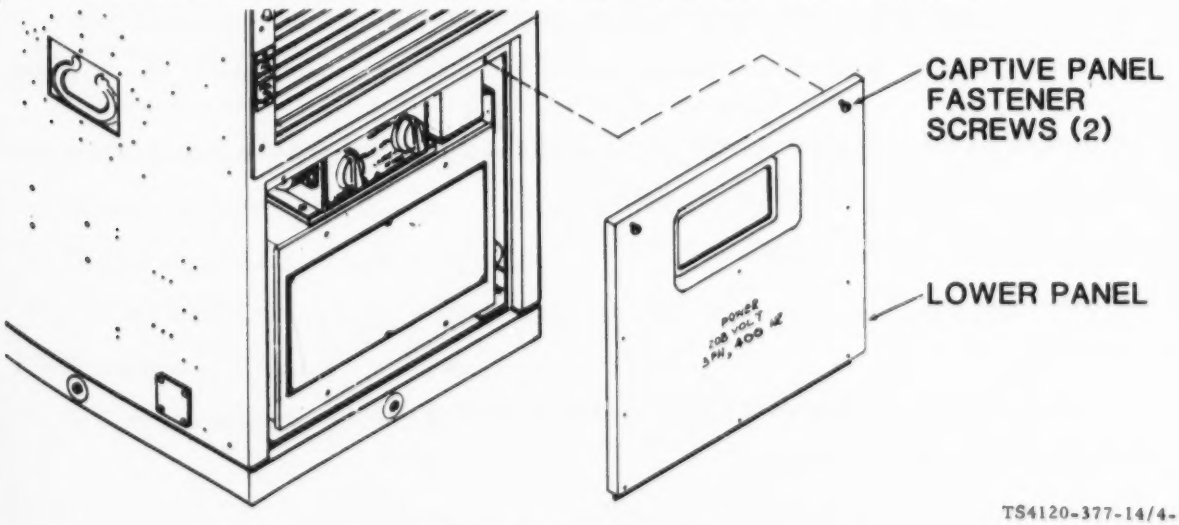


Figure 4-52. Lower Front Panel

(4) Tilt top of lower front panel out and lift panel up to remove.

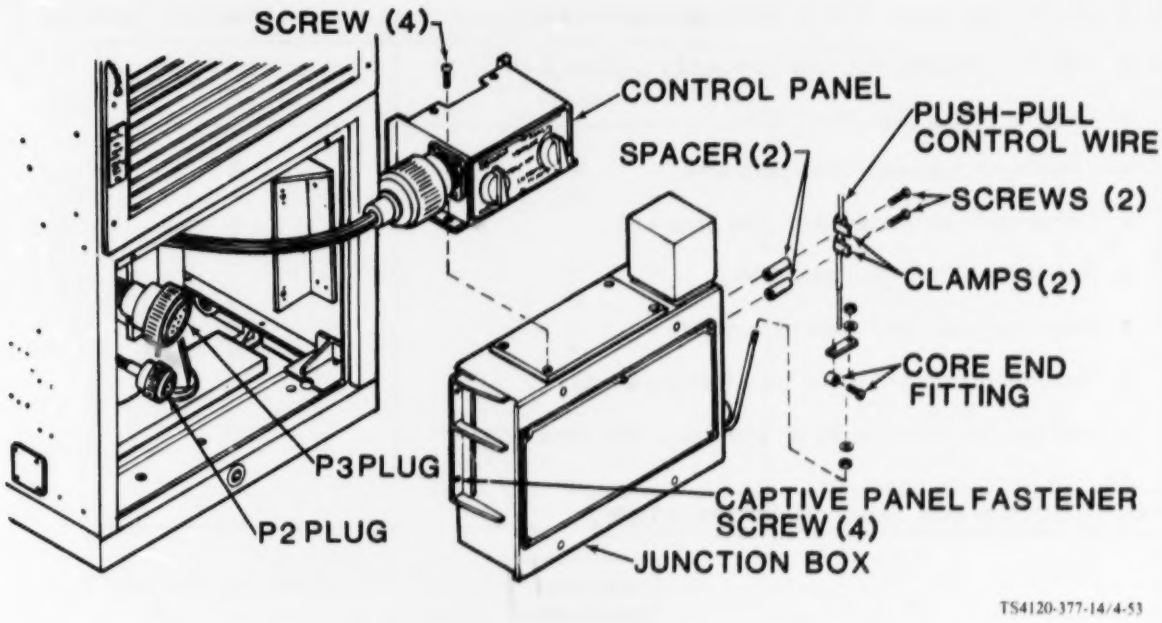


Figure 4-53. Junction Box Removal/Installation

(5) Using screwdriver, loosen four captive panel fastener screws in junction box mounting flange.

(6) Slip junction box out to gain access to control panel, P2 and P3 plugs, and push-pull control wire clamps.

(7) Using screwdriver, remove four screws from control panel.

(8) Support control panel so that capillary line and electrical harness will not be damaged.

(9) Using screwdriver, remove two screws and spacers from push-pull cable clamps on side of junction box.

(10) Using screwdriver, loosen screw in core end fitting and remove from end of push-pull control wire.

(11) Pull push-pull control wire free from junction box.

(12) Disconnect P2 and P3 harness plugs.

(13) Remove junction box.

b. Installation

(1) Place junction box close enough to unit to attach plugs P2 and P3.

(2) Connect plug P2 to connector J2.

(3) Connect plug P3 to connector J3.

(4) Using screwdriver, secure control panel to junction box with four screws.

(5) Check that circuit breaker reset knob on rear of air conditioner is pushed in all the way.

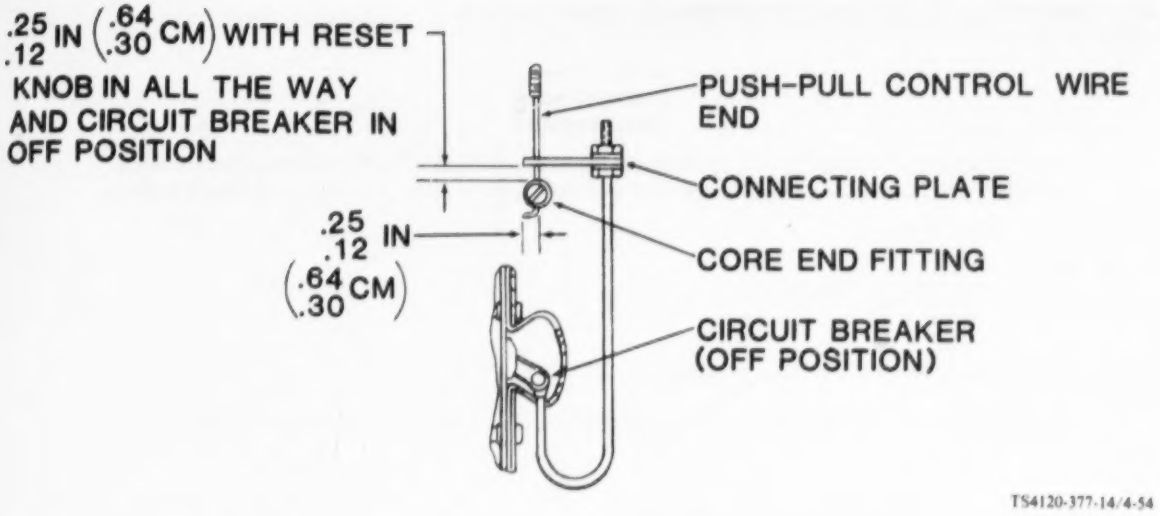

.25 IN (.64 CM) WITH RESET KNOB IN ALL THE WAY AND CIRCUIT BREAKER IN OFF POSITION
.25 IN (.64 CM)
PUSH-PULL CONTROL WIRE END
CONNECTING PLATE
CORE END FITTING
CIRCUIT BREAKER (OFF POSITION)
TS4120-377-14/4-54

Figure 4-54. Reset Control Wire Connection

(6) Insert push-pull control wire end through hole in connector plate.

(7) Slip core end fitting on push-pull control wire end and use screwdriver to tighten screw.

(8) Flip circuit breaker to OFF (down) position.

(9) With core end fitting positioned as shown on figure 4-54, secure push-pull control wire casing to side of junction box with two screws, spacers, and clamps.

(10) Check that circuit breaker is turned on when knob on rear of air conditioner is pulled out and pushed in. Pushing knob in should not turn circuit breaker off.

(11) Carefully move junction box into position and aline mounting hardware.

(12) Using screwdriver, tighten four captive panel fastener screws.

(13) Insert bottom flange of lower front panel inside the lip of the cabinet base.

(14) Push top of lower front panel into position.

(15) Using screwdriver, secure lower front panel with two captive panel fastener screws.

(16) Connect power cable.

(17) Turn on power at power source.

4-47. JUNCTION BOX ACCESS TO INTERNAL COMPONENTS

WARNING

Disconnect input power to air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting unit off at control panel does not disconnect unit power.

a. Access

(1) Turn power off at power source.

(2) Disconnect power cable at air conditioner.

(3) Using screwdriver, loosen two captive panel fastener screws in lower front panel.

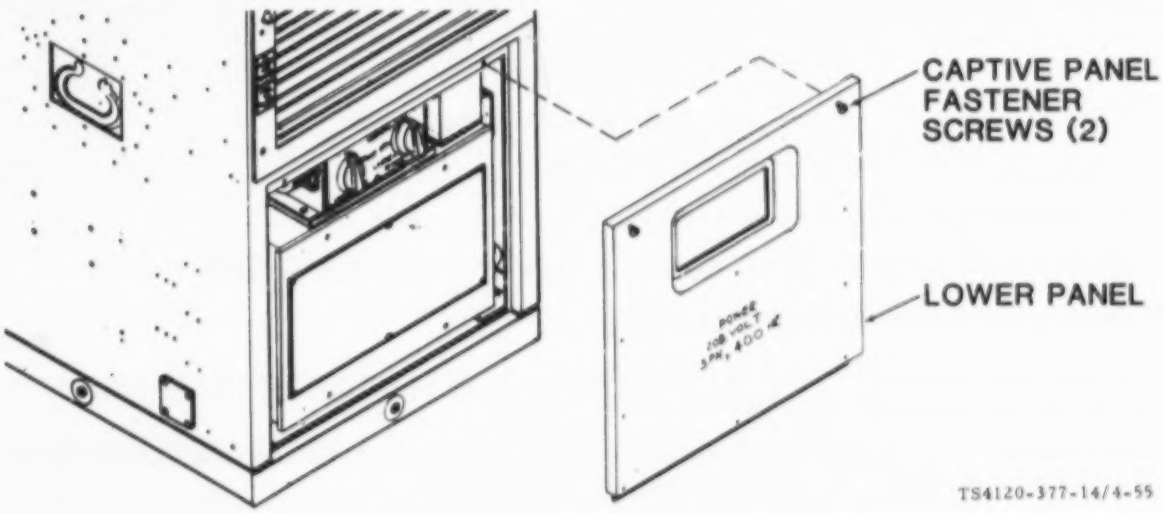


Figure 4-55. Lower Front Panel

(4) Tilt top of lower front panel out and lift panel up to remove.

(5) Using screwdriver, loosen four captive panel fastener screws in junction box cover.

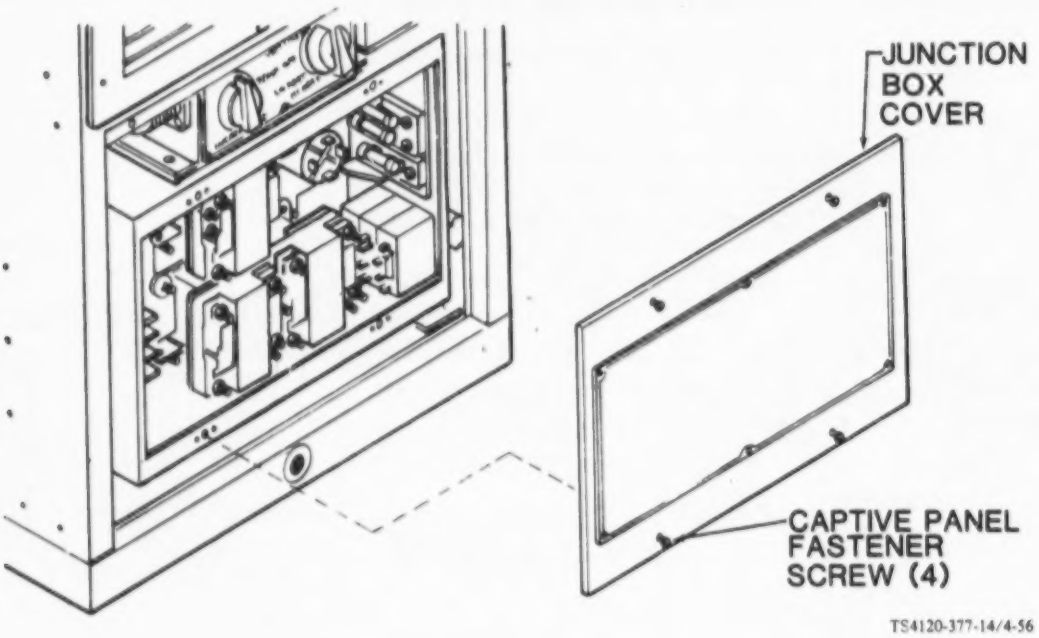


Figure 4-56. Junction Box Cover

(6) Remove junction box cover.

b. Reassemble

(1) Place junction box cover on box and aline hardware.

(2) Using screwdriver, secure junction box cover with four captive panel fastener screws.

(3) Insert bottom flange of lower front panel inside the lip of the cabinet base.

(4) Push top of lower front panel into position.

(5) Using screwdriver, secure lower front panel with two captive panel fastener screws.

(6) Connect power cable.

(7) Turn on power at power source.

4-48. CIRCUIT BREAKER EXTERNAL RESET CONTROL

Preliminary procedures: 1. Remove rear panel. (See para 4-32.)

2. Remove junction box. (See para 4-46.)

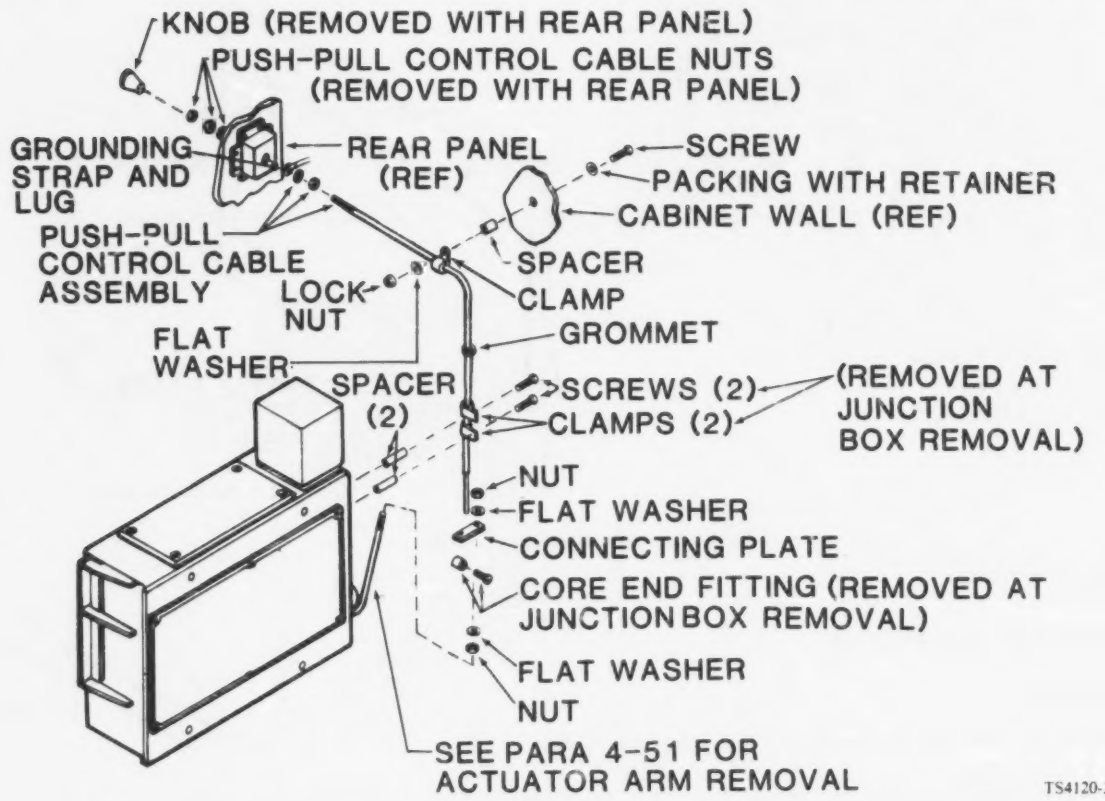


Figure 4-57. Circuit Breaker External Reset

a. Inspection

(1) Check that parts are in place and that wire moves freely in cable.

(2) Using figure 4-57 as a guide, remove and replace any damaged or missing parts.

Follow-on procedure: 1. Install rear panel. (See para 4-32.)

2. Install junction box. (See para 4-46.)

4-49. JUNCTION BOX HARNESSES

Preliminary procedure: Remove junction box. (See para 4-46.)

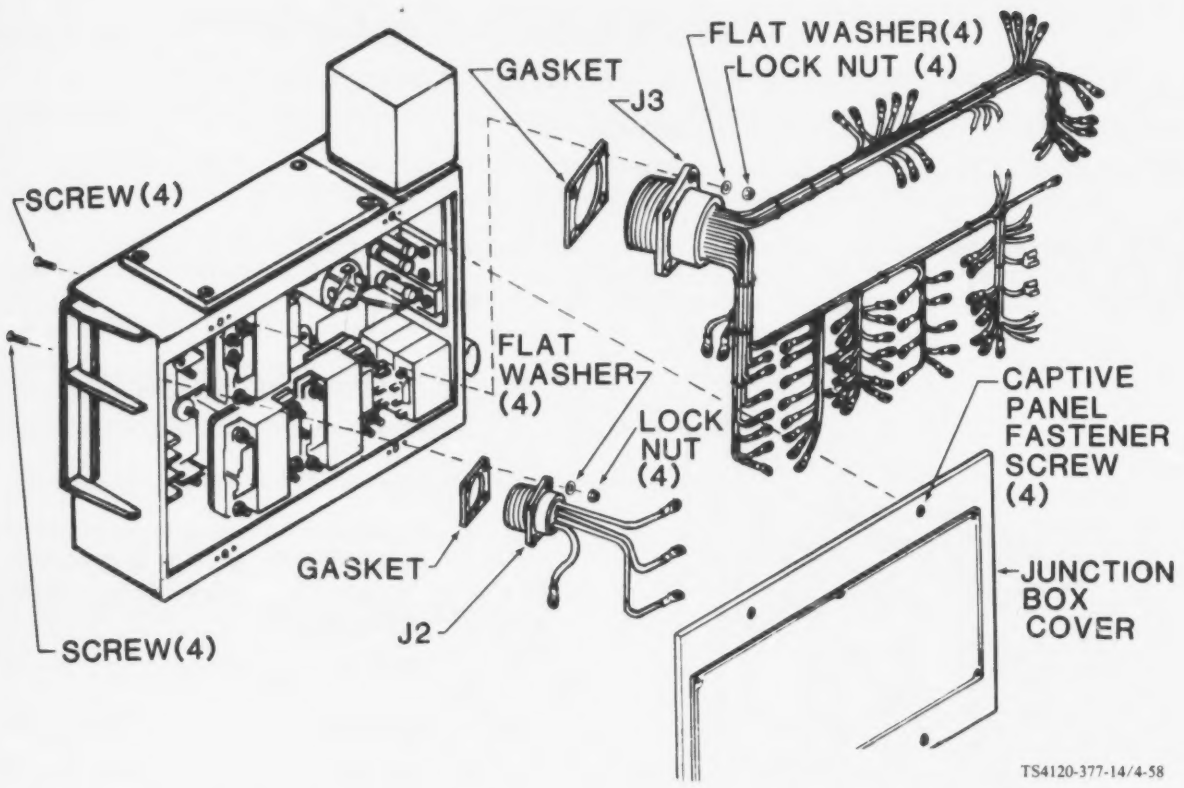


Figure 4-58. Junction Box Wiring Harnesses

a. Access

(1) Using screwdriver, loosen four captive panel fastener screws in junction box cover.

(2) Remove junction box cover.

b. Inspection/Test

(1) Check connectors for general condition and loose, broken, or missing contacts. Replace damaged connectors.

(2) Check individial wires for loose solder connections, loose terminal lug connections, cut or frayed insulation, and cut or broken wires.

(3) See wiring diagram (fig. 4-20) and continuity test individual wires. Repair or replace wires with no continuity.

c. Repair

(1) See paragraph 4-36 for general wire repair instructions.

(2) See table 4-3 (Wire List) for wire lengths and terminal/connector information.

(3) After repairs are complete, place junction box cover on box and aline hardware.

(4) Using screwdriver, secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-46.)

4-50. TRANSFORMER (T1)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

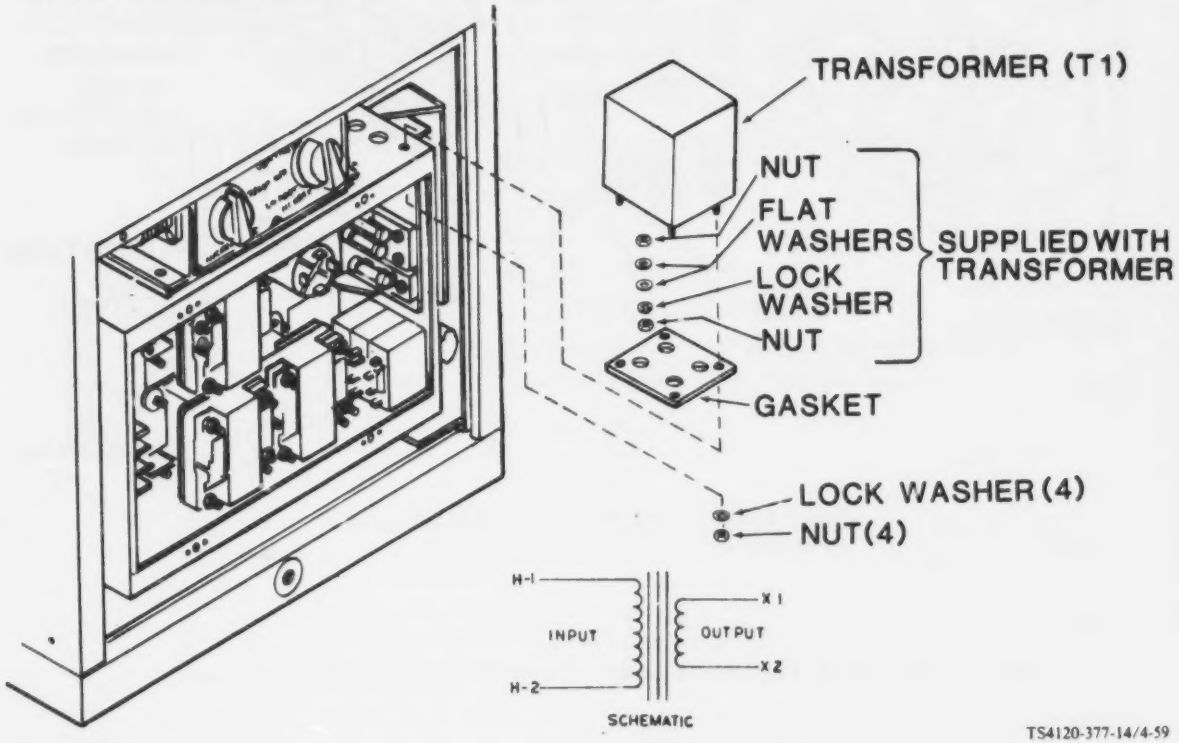


Figure 4-59. Transformer (T1)

a. Removal

(1) Tag and disconnect wire leads.

(2) Using wrench, remove four nuts and lock washers from transformer mounting studs.

(3) Remove transformer and gasket.

b. Test

(1) Connect the probes of a continuity tester or a multimeter set on the lowest OHMS scale to terminal studs H1 and H2. If the primary winding is open, replace the transformer.

(2) Connect the probes of a continuity tester or a multimeter set on the lowest OHMS scale to terminal studs X1 and X2. If the secondary winding is open, replace the transformer.

(3) Connect one probe of a multimeter set on high OHMS scale to either terminal stud H1 and H2 and the other probe to the transformer case. If resistance is less than 500,000 ohms, replace the transformer.

(4) Connect one probe of a multimeter set on high OHMS scale to either terminal stud X1 and X2 and the other probe to the transformer case. If resistance is less than 500,000 ohms, replace the transformer.

(5) Connect one probe of a multimeter set on high OHMS scale to either terminal stud H1 or H2 and the other probe to either terminal stud X1 and X2. If resistance is less than 500,000 ohms, replace the transformer.

c. Installation

(1) Position transformer and gasket on outside rear of junction box.

(2) Using wrench, secure transformer with four nuts and lock washers.

(3) See tags and wiring diagram (fig. 4-20) and connect leads.

Follow-on procedure: Install junction box cover and lower front panel. (see para 4-47.)

4-51. COMPRESSOR CIRCUIT BREAKER (CB1)

Preliminary procedure: Remove junction box. (See para 4-46.)

a. Access

(1) Using screwdriver, loosen four captive panel fastener screws in junction box cover.

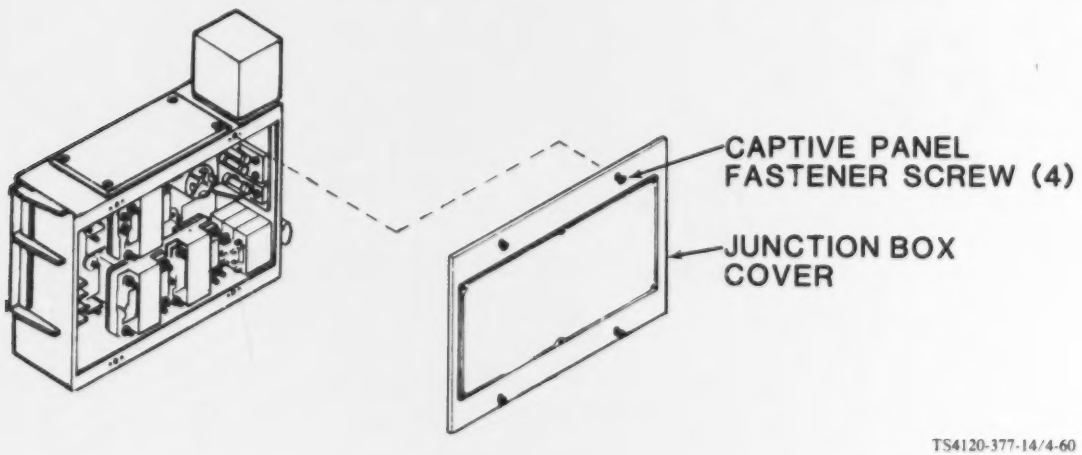


Figure 4-60. Junction Box Cover

(2) Remove junction box cover.

b. Inspection

(1) Check that mounting hardware, circuit breaker cover, actuator arm, and circuit breaker are in place and secure.

(2) Check that wire leads are properly connected to circuit breaker and are not damaged. See wiring diagram (fig. 4-20.)

(3) Check circuit breaker for signs of overheating or other visible damage.

c. Test

(1) Set circuit breaker reset bar in OFF position.

(2) Use multimeter set on lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, C1 and C2, and auxiliary switch terminals C and NO. All contacts should be open. If there is continuity on any check, replace circuit breaker.

(3) Press reset bar toward the OFF stop, then place it in the ON position.

(4) Use a multimeter set on the lowest OHMS scale and repeat continuity checks between terminals A1 and A2, B1 and B2, C1 and C2, and auxiliary switch terminals C and NO. All four contacts should be closed. If there is no continuity on any check, replace circuit breaker.

d. Removal

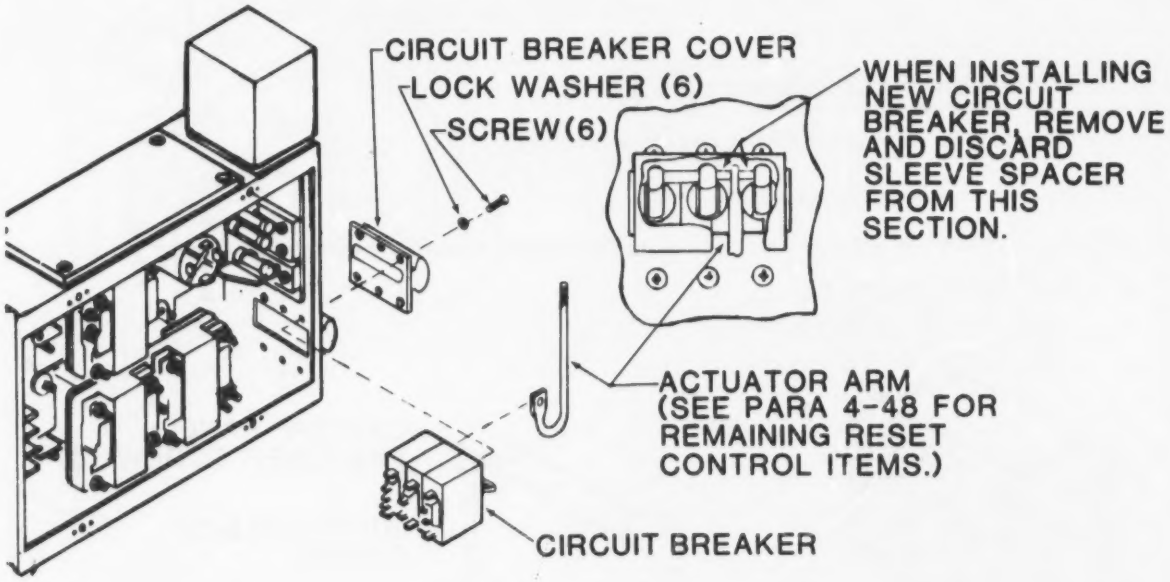

CIRCUIT BREAKER COVER
LOCK WASHER (6)
SCREW(6)
WHEN INSTALLING NEW CIRCUIT BREAKER, REMOVE AND DISCARD SLEEVE SPACER FROM THIS SECTION.
ACTUATOR ARM (SEE PARA 4-48 FOR REMAINING RESET CONTROL ITEMS.)
CIRCUIT BREAKER
TS4120-377-14/4-61

Figure 4-61. Circuit Breaker (CB1)

(2) Using screwdriver, remove six screws, lock washers, and flat washers.

(3) Using pliers, pull shaft that holds reset toggles together and disconnect reset actuator arm.

(4) Remove circuit breaker and circuit breaker cover.

NOTE

See paragraph 4-48 for repairs on circuit breaker push-pull reset parts.

e. Installation

(1) Using pliers, pull shaft that holds reset toggles together on circuit breaker.

(2) Place actuator arm into position and reinsert reset toggle shaft.

(3) Using screwdriver, install circuit breaker and circuit breaker cover with six screws, lock washers, and flat washers.

(4) Using tags and wiring diagram (fig. 4-20) connect leads with spade type terminals.

(5) For two solder connection leads, cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(6) Slip heat shrinkable tubing over leads.

(7) Solder leads in place using tags and wiring diagram. (See fig. 4-20.)

(8) Slip heat shrinkable tubing over solder connection and shrink in place.

(9) Remove tags.

(10) Using screwdriver, install junction box cover and tighten four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-46.)

4-52. FUSES (F1, F2, and F3)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

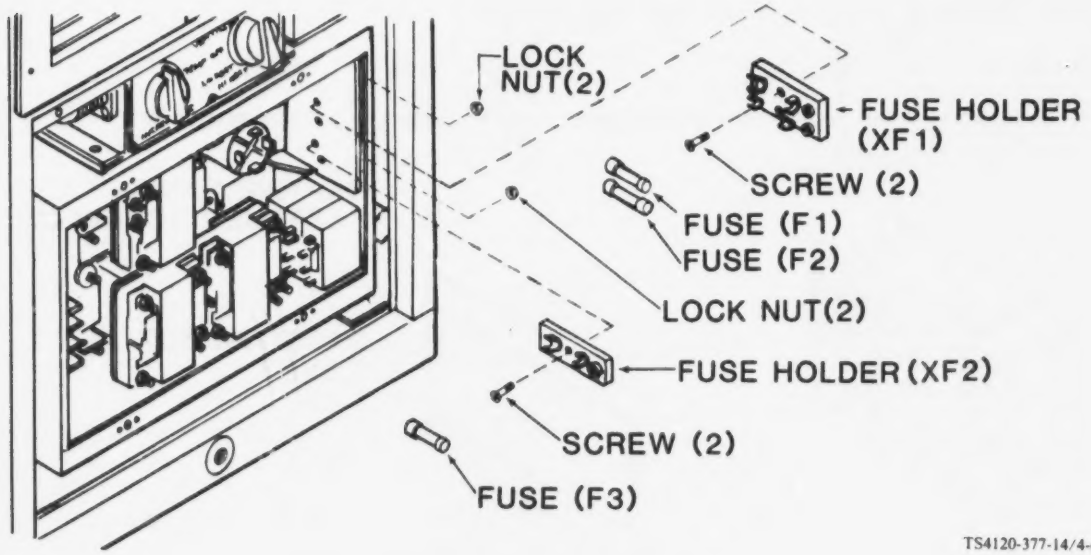


Figure 4-62. Fuses (F1, F2, and F3)

a. Inspection/Test

(1) Inspect for cracks, corrosion, loose electrical connections, and loose mounting hardware. Repair and tighten loose electrical connections and tighten loose mounting hardware. Replace fuse block if it is cracked, broken, or badly corroded.

(2) If a fuse is suspected to be bad, pull it from the fuse block and look for broken or melted element.

(3) Using a multimeter, check continuity. If there is no continuity, replace fuse.

b. Removal

(1) Pull fuses.

(2) If fuse block is to be replaced, tag and remove wire leads.

(3) Using screwdriver and wrench, remove two screws and lock nuts.

(4) Pull fuse block from box.

c. Installation

(1) Place fuse block in box and aline holes.

(2) Using screwdriver, pliers, and wrench secure fuse block to box with two screws and lock nuts.

(3) See tags and wiring diagram (fig. 4-20) and connect leads. Remove tags.

(4) Place fuse(s) into fuse block clips.

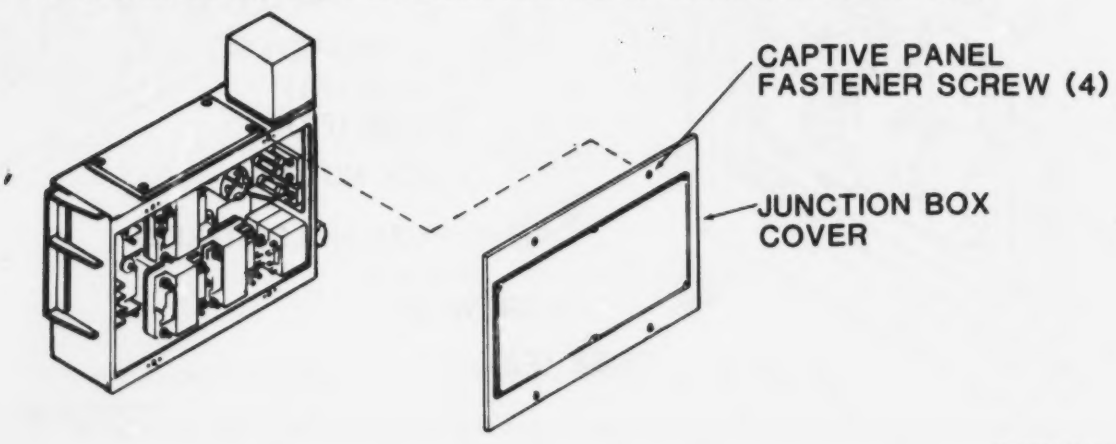
Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-53. RECTIFIER (CR1)

Preliminary procedure: Remove junction box. (See para 4-46.)

a. Access

(1) Using screwdriver, loosen four captive panel fastener screws in junction box cover.



TS4120-377-14/4-63

Figure 4-63. Junction Box Cover

(2) Remove junction box cover.

b. Inspection/Test

(1) Check that wire leads are properly connected to rectifier and are not damaged. See wiring diagram (fig. 4-20).

(2) If rectifier is suspected bad, tag and remove rectifier leads.

(3) Use a continuity tester or a multimeter set on the lowest OHMS scale to test for continuity between each of the four rectifier terminals and mounting plate. If continuity is found between any rectifier terminal and mounting plate, replace rectifier.

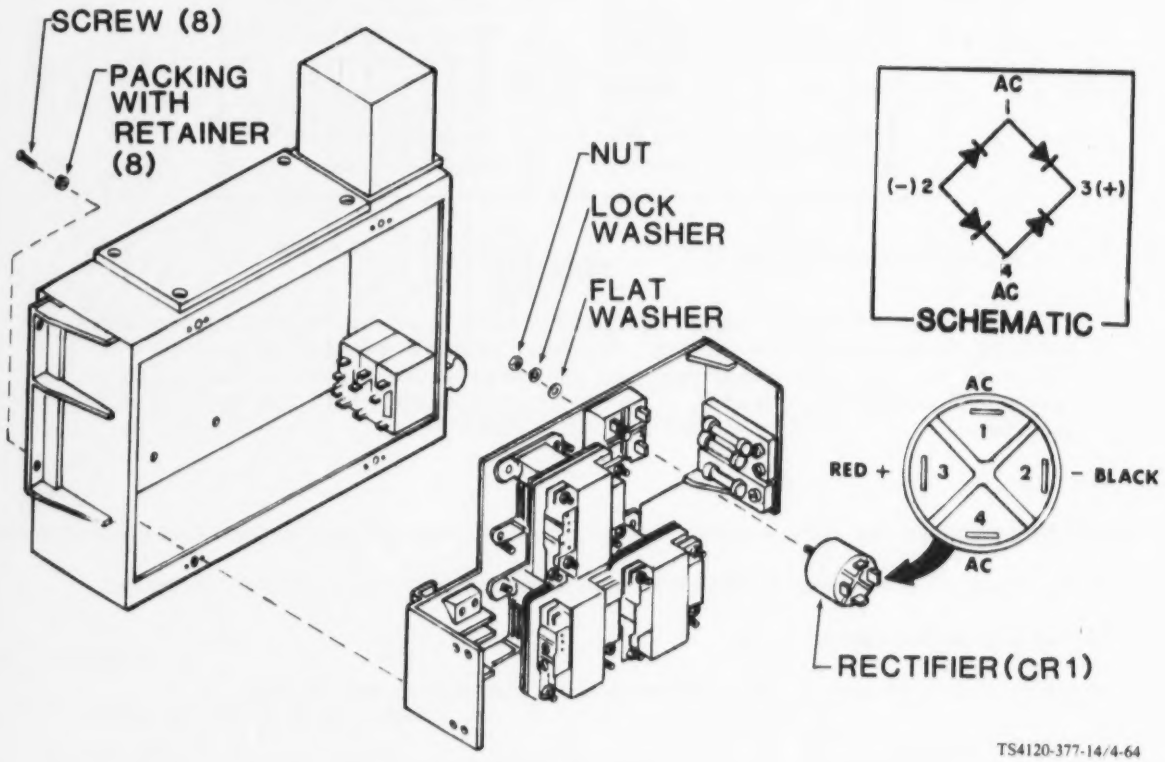


Figure 4-64. Rectifier (CR1)

(4) Use a multimeter set on lowest OHMS scale to test resistance across rectifier bridge in accordance with the following table. If resistance is different from that indicated in table, replace rectifier.

TABLE 4-4. RECTIFIER TEST

Meter Lead		Resistance
Neg	Pos	
Term. 1	Term. 2	20 ohms or less
Term. 1	Term. 3	1000 ohms or more
Term. 2	Term. 1	1000 ohms or more
Term. 2	Term. 4	1000 ohms or more
Term. 4	Term. 2	20 ohms or less
Term. 4	Term. 3	1000 ohms or more
Term. 3	Term. 1	20 ohms or less
Term. 3	Term. 4	20 ohms or less
Term. 1	Term. 4	1000 ohms or more
Term. 4	Term. 1	1000 ohms or more
Term. 2	Term. 3	1000 ohms or more
Term. 3	Term. 2	80 ohms or less

NOTE

A diode bridge will sometimes act differently under a power test than resistance tests indicate. To perform a power test, apply 28 volts ac across terminals 1 and 4 and use a dc voltmeter with negative probe on terminal 2 and positive probe on terminal 3 to test output voltage. The meter should read 24 ± 5 volts. If output voltage is not within limits, replace rectifier.

c. Removal

(1) Using a screwdriver, remove eight screws and packing with retainer from rear face of junction box.

(2) Pull component mounting panel out far enough to gain access to rectifier mounting nut.

(3) Tag and remove rectifier leads.

(4) Using wrench, remove nut, lock washer, and flat washer from rectifier stud.

(5) Remove rectifier.

d. Installation

(1) Insert rectifier mounting stud through hole in component mounting panel and secure with nut, lock washer, and flat washer.

(2) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(3) Slip heat shrinkable tubing over leads.

(4) Solder leads in place using tags and wiring diagram. (See fig. 4-20.)

(5) Slip heat shrinkable tubing over solder connection and shrink in place.

(6) Remove tags.

(7) Slip component mounting panel into place and aline holes.

(8) Using screwdriver, secure component mounting panel with eight screws and packing with retainers.

(9) Using screwdriver, install junction box cover and tighten four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-46.)

4-54. TIME DELAY RELAY (K3)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

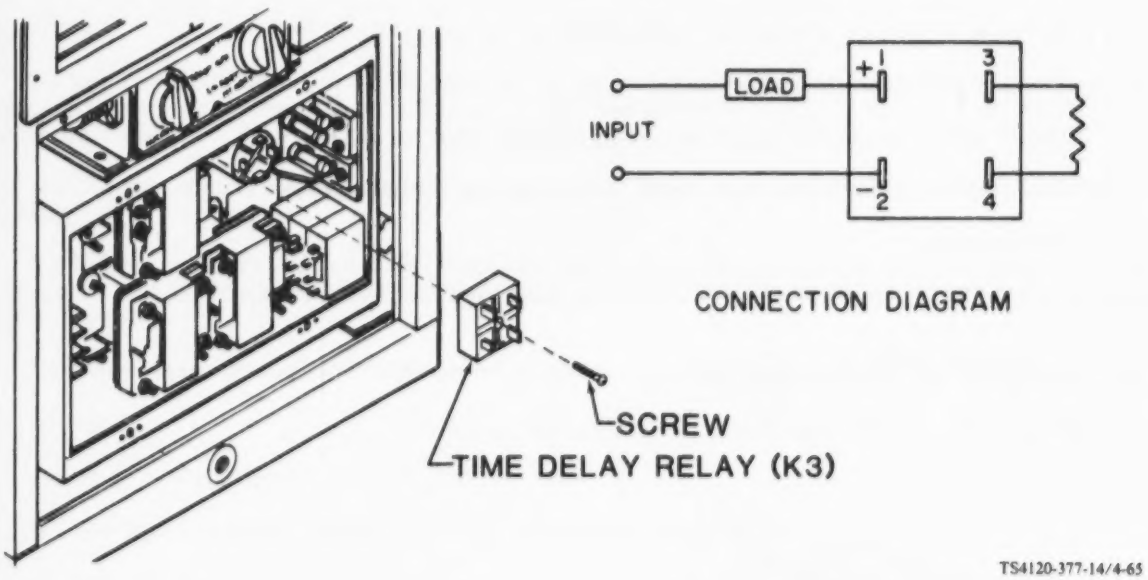


Figure 4-65. Time Delay Relay

a. Inspection

(1) Check for loose wire connections.

(2) Check for cracks, evidence of overheating, and other visible damage. Replace if damaged.

b. Test

(1) Using a multimeter set on lowest OHMS scale, check continuity.

Terminal 1(+) to 2 (-) — Continuity should not be indicated

Terminal 3 to 4 — Continuity should be indicated

(2) Set multimeter at appropriate dc voltage scale.

(3) Apply power across terminals 1 and 2. Voltage indicated should be 24 ± 5 volts dc. After approximately 30 second time delay, voltages should drop to less than two volts.

(4) Replace time delay relay if it fails any of the above tests.

c. Removal

(1) Tag and unsolder wire leads.

(2) Using screwdriver, remove screw from time delay relay.

(3) Remove time delay relay.

d. Installation

(1) Aline antirotation pin and mounting holes.

(2) Using screwdriver, secure time delay relay to junction box mounting panel with screw.

(3) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(4) Slip heat shrinkable tubing over leads.

(5) Solder leads in place using tags and wiring diagram. (See fig. 4-20.)

(6) Slip heat shrinkable tubing over solder connection and shrink in place.

(7) Remove tags.

Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-55. COMPRESSOR START RELAY (K1)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

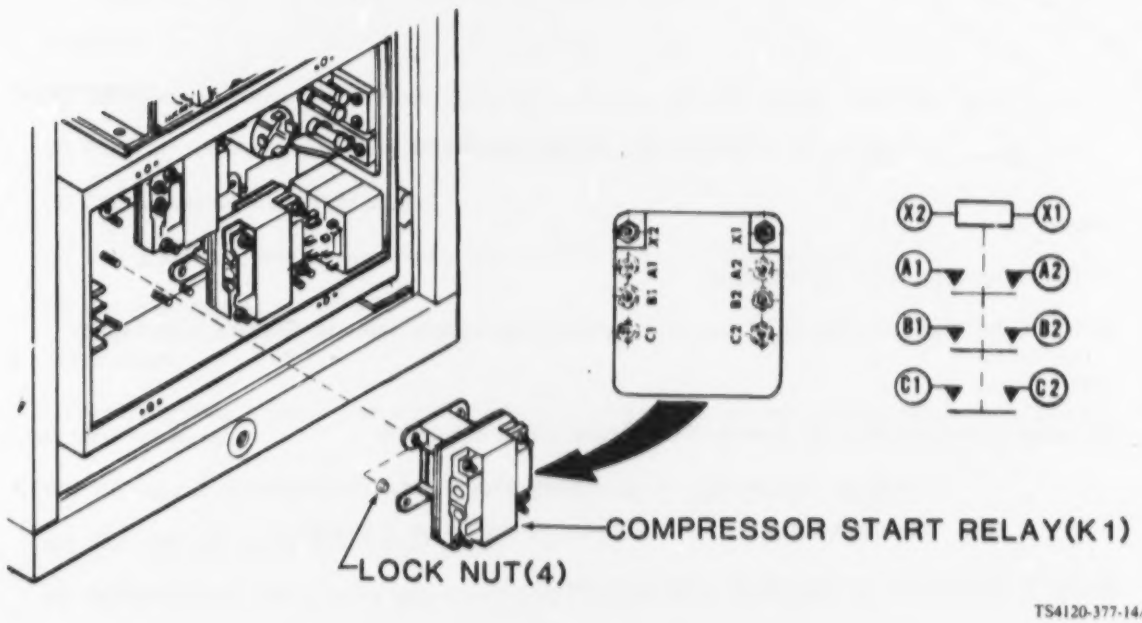


Figure 4-66. Compressor Start Relay

a. Removal

(1) Tag and disconnect wire leads.

(2) Using wrench, remove four lock nuts from relay.

(3) Remove relay.

b. Inspection

(1) Check for loose, corroded, missing, or broken terminal connections.

(2) Check relay for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Test

(1) Use continuity tester or a multimeter set on the lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be open. If there is continuity, replace the relay.

(2) Check continuity between coil terminals X1 and X2. If there is no continuity, the coil is open. Replace the relay.

(3) Apply external 24 volts dc power across terminals X1 and X2 and repeat continuity checks between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be closed. If there is no continuity, replace the relay.

(4) Remove the external 24 volts dc power source from coil terminals X1 and X2.

d. Installation

(1) Using wrench, secure relay with four lock nuts.

(2) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(3) Remove tags.

Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-56. HEATER RELAY (K2)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

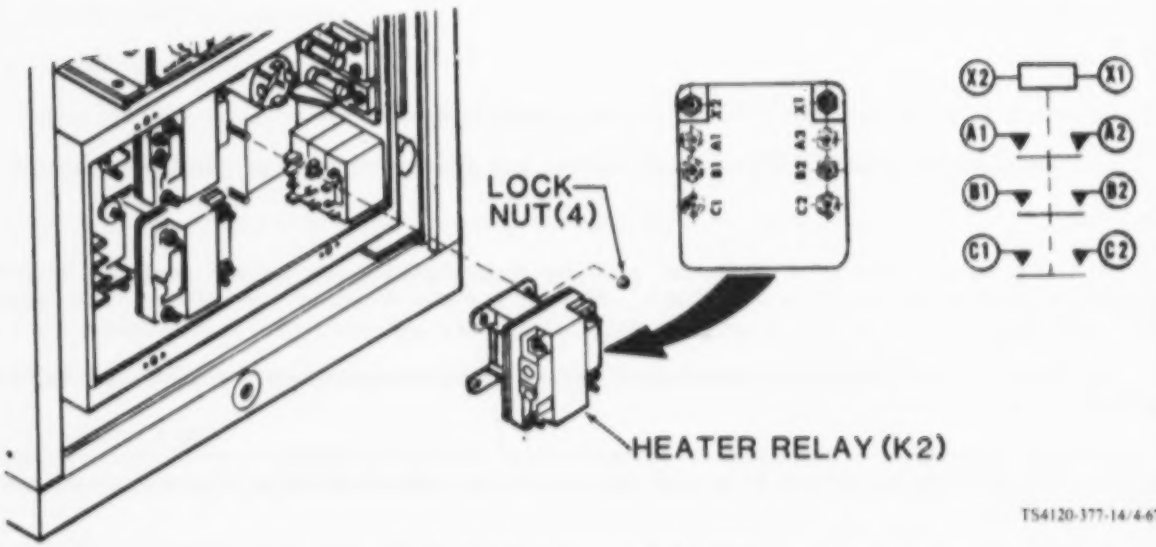


Figure 4-67. Heater Relay (K2)

a. Removal

(1) Tag and disconnect wire leads.

(2) Using wrench, remove four lock nuts from relay.

(3) Remove relay.

b. Inspection

(1) Check for loose, corroded, missing, or broken terminal connections.

(2) Check relay for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Test

(1) Use a continuity tester or a multimeter set on the lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be open. If there is continuity, replace the relay.

(2) Check continuity between coil terminals X1 and X2. If there is no continuity, the coil is open. Replace the relay.

(3) Apply external 24 volts dc power source across terminals X1 and X2 and repeat continuity checks between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be closed. If there is no continuity, replace the relay.

(4) Remove the external 24 volts dc power source from the coil terminals X1 and X2.

d. Installation

(1) Using wrench, secure relay with four lock nuts.

(2) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(3) Remove tags.

Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-57. FAN MOTOR RELAY (K4)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

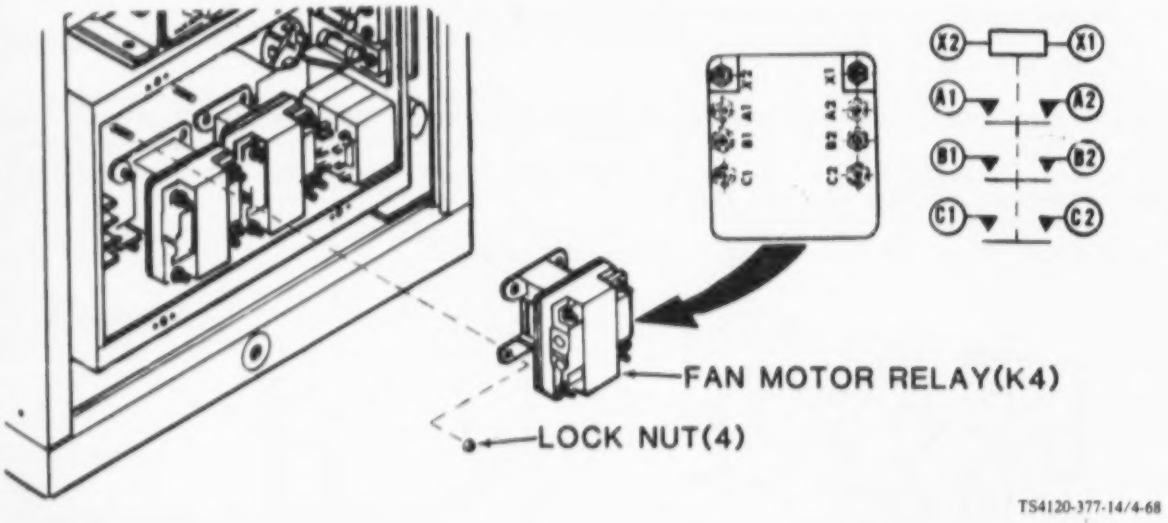


Figure 4-68. Fan Motor Relay (K4)

a. Removal

(1) Tag and disconnect wire leads.

(2) Using wrench, remove four lock nuts from relay.

(3) Remove relay.

b. Inspection

(1) Check for loose, corroded, missing, or broken terminal connections.

(2) Check relay for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Test

(1) Use a continuity tester or a multimeter set on the lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be open. If there is continuity, replace the relay.

(2) Check continuity between coil terminals X1 and X2. If there is no continuity the coil is open. Replace the relay.

(3) Apply external 24 volts dc power source across terminals X1 and X2 and repeat continuity checks between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be closed. If there is no continuity, replace the relay.

(4) Remove the external 24 volts dc power source from coil terminals X1 and X2.

d. Installation

(1) Using wrench, secure relay with four lock nuts.

(2) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(3) Remove tags.

Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-58. TERMINAL BOARDS (TB1 and TB2)

Preliminary procedure: Remove junction box cover. (See para 4-47.)

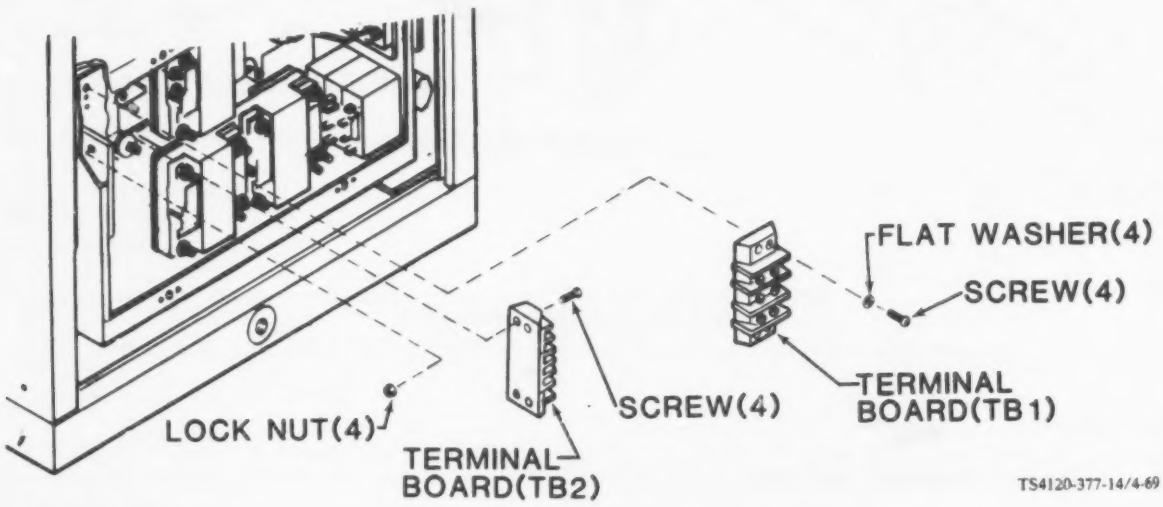


Figure 4-69. Terminal Boards (TB1 and TB2)

a. Inspection

(1) Check terminal boards for loose or corroded terminals, cracks, and obvious damage. Replace if cracked or broken.

(2) Check that wire leads are secure and properly located. (See fig. 4-20.)

b. Removal

(1) Tag and disconnect wire leads.

(2) Using screwdriver and wrench, remove four screws and nuts from terminal board (TB2).

(3) Using screwdriver, remove four screws and flat washers from terminal board (TB1).

(4) Remove terminal boards.

c. Installation

(1) Using screwdriver, secure terminal board (TB1) with four screws and flat washers.

(2) Using screwdriver, pliers, and wrench, secure terminal board (TB2) with four each screws and nuts.

(3) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(4) Remove tags.

Follow-on procedure: Install junction box cover and lower front panel. (See para 4-47.)

4-59. JUNCTION BOX HOUSING, PANEL, AND COVER

Preliminary procedure: Remove junction box. (See para 4-46.)

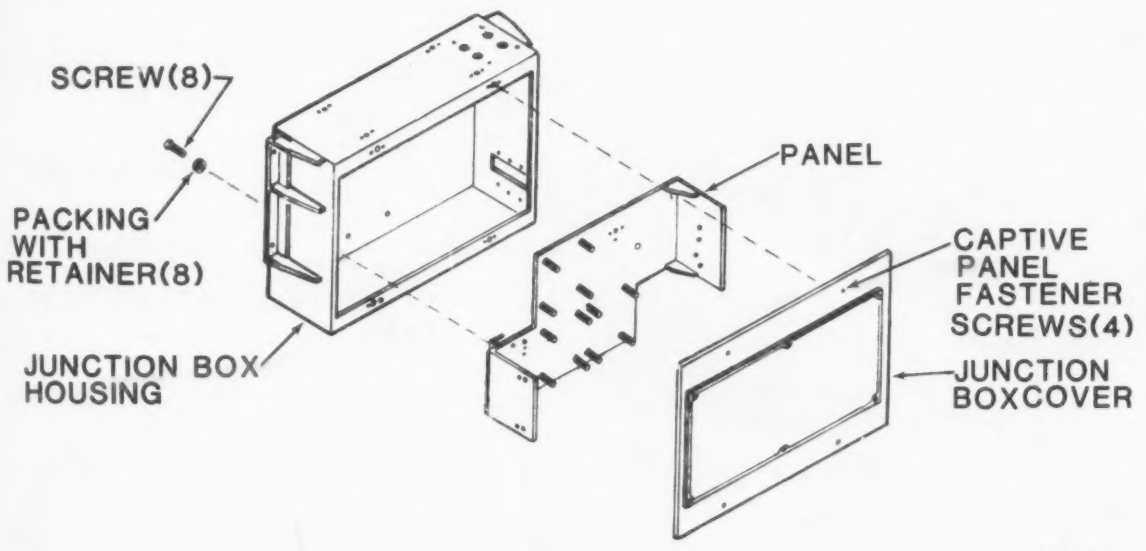


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Figure 4-70. Junction Box Housing, Panel, and Cover

a. Access

(1) Using screwdriver, loosen four captive panel fastener screws in junction box cover.

(2) Remove cover.

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

(2) Check that gaskets are not cracked, loose, or missing and that fluid diagram and electrical schematic plates are in place and legible. Replace gasket and diagram plates as required.

(3) Check junction box housing and panel for cracked welds and loose or missing hardware. Replace or repair as required.

c. Disassembly/Reassembly. See paragraphs 4-48 through 4-58 for removal/installation of parts.

d. Installation. Using screwdriver, secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-46.)

4-60. HEATER CUTOUT (THERMOSTAT) SWITCH (S4)

Preliminary procedure: Remove top panel. (See para 4-28.)

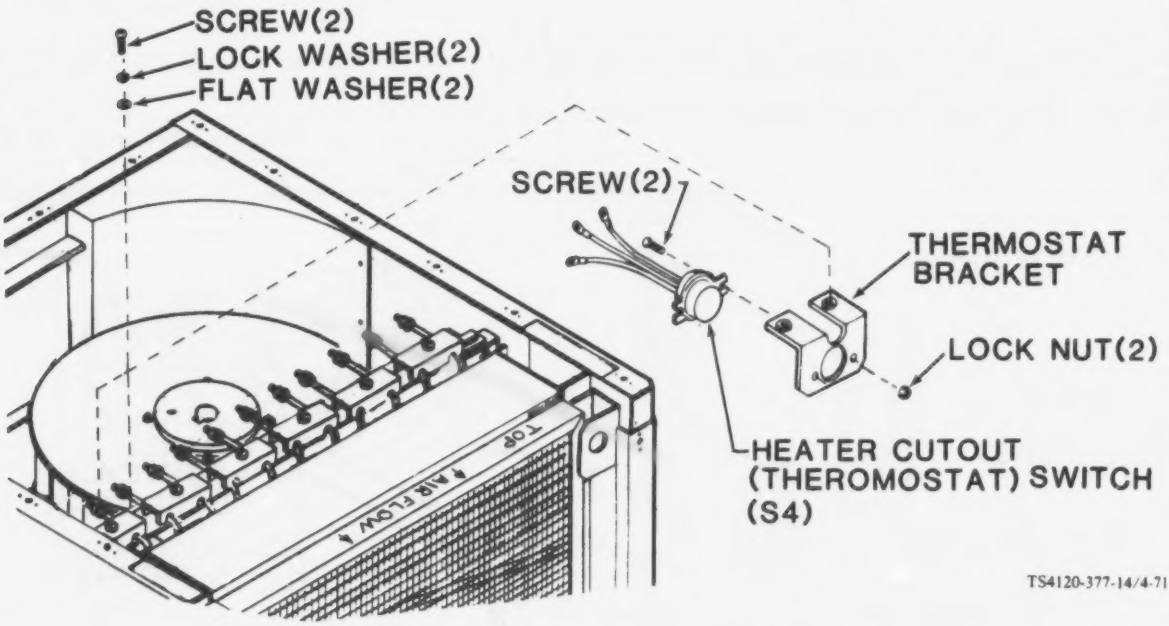

Figure 4-71. Heater Cutout (Thermostat) Switch (S4)

a. Removal

(1) Check to see that power has been disconnected.

(2) Tag and disconnect leads.

(3) Using screwdriver and wrench, remove two screws and lock nuts.

(4) Remove heater cutout (thermostat) switch.

(5) If thermostat bracket is to be removed, use screwdriver to remove two screws, lock washers, and flat washers and remove bracket.

b. Test. With thermostat at room temperature, use a multimeter set on the lowest OHMS scale to check for continuity between each pair of contacts (4 and 6, 4 and 5, and 5 and 6). If continuity is not indicated between all contacts, replace the thermostat.

NOTE

For full operational test of thermostat use an external heat source. Thermostat should open (no continuity across contacts) at temperature increase of 194°F ± 9° (90°C ± 5°) and close at temperature decrease at 142°F ± 16° (61°C ± 9°).

c. Installation

(1) If bracket was removed, use screwdriver and secure bracket to heater support with two screws, lock washers, and flat washers.

(2) Using screwdriver and wrench, secure thermostat to bracket with two screws and lock nuts.

(3) See tags and wiring diagram (fig. 4-20) and solder wire leads.

(4) Remove tags.

Follow-on procedure: Install top cover. (See para 4-28.)

4-61. ELECTRIC HEATER (ELEMENTS) (HR1 THROUGH HR6)

Preliminary procedure: Remove top panel. (See para 4-28.)

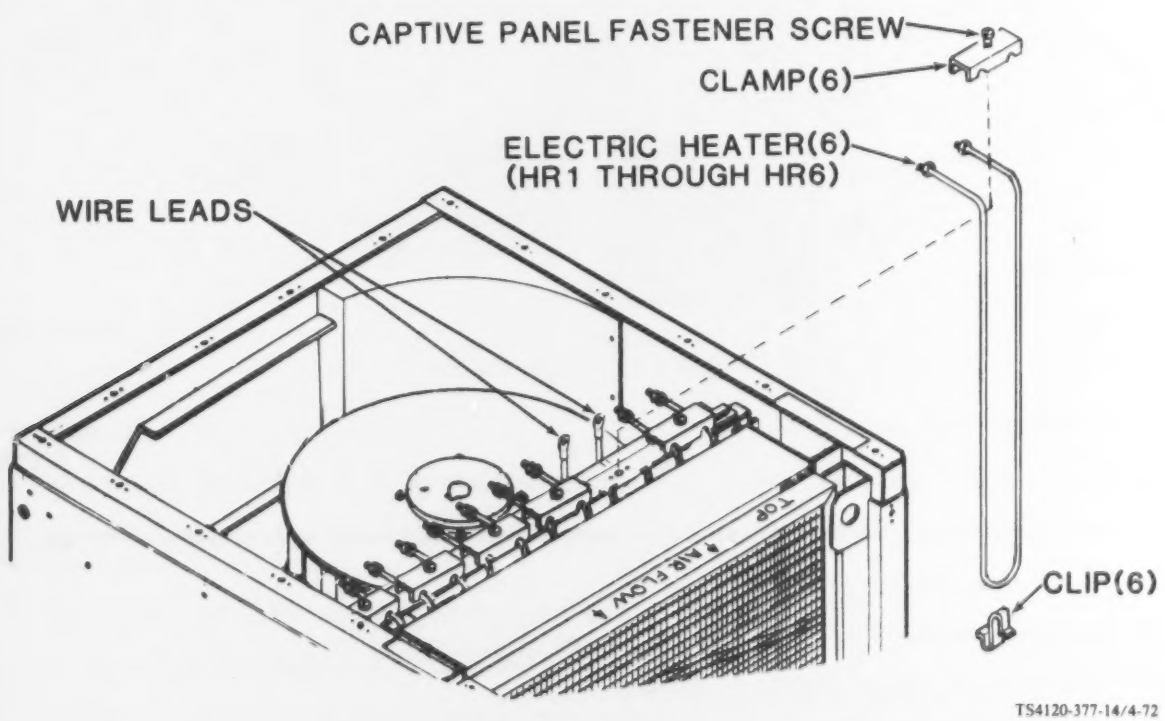

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Figure 4-72. Electric Heater (Elements) (HR1 through HR6)

a. Inspection/Testing

(1) Check heater elements for deformation, damaged terminals, threads, cracked, or broken outside covering. Replace if damaged.

(2) Using a multimeter set on lowest OHMS scale, check for continuity between the two terminal studs. Replace heater if no continuity is indicated.

b. Heater removal

(1) Check to see that power has been disconnected.

(2) Tag and disconnect the wire leads from the heater that is being removed.

(3) Using a screwdriver, loosen the captive panel fastener screw in the retainer clamp.

(4) Pull heater element free of lower mounting clip and remove heater.

c. Heater support and bracket removal

(1) Remove all six heaters.

(2) Using screwdriver, remove two screws, lock washers, and flat washers.

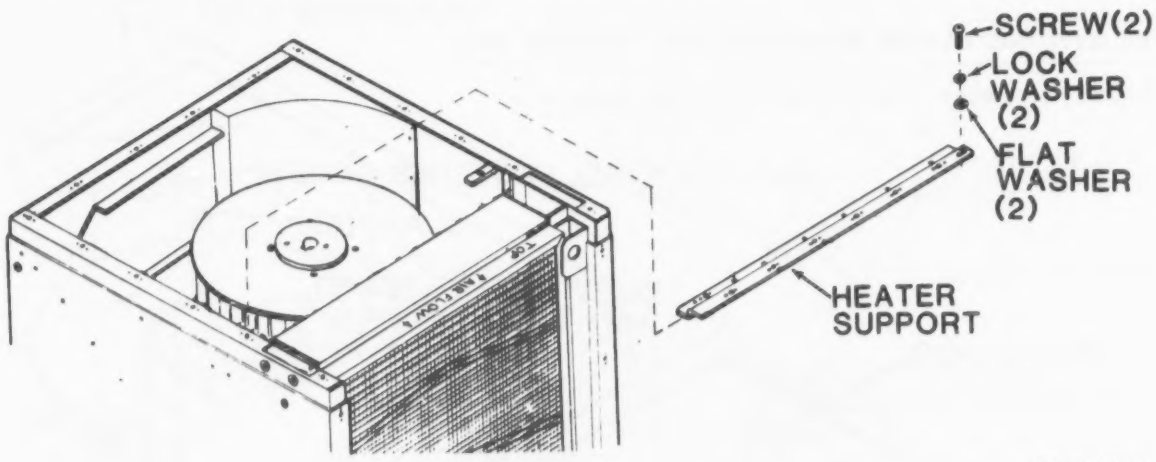

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Figure 4-73. Heater Support

(3) Remove heater support.

d. Heater support installation

(1) Using screwdriver, secure support to bracket with two screws, lock washers, and flat washers.

(2) Install heaters. (See e. below.)

e. Heater installation

(1) Insert heater element into lower mounting clip.

(2) Using screwdriver, secure top of heater with retainer clamp by tightening the captive panel fastener screw.

(3) See tag and wiring diagram (fig. 20) and connect wire leads.

(4) Remove tags.

Follow-on procedure: Install top panel. (See para 4-28.)

4-62. EVAPORATOR FAN

Preliminary procedure: Remove top panel. (See para 4-28.)

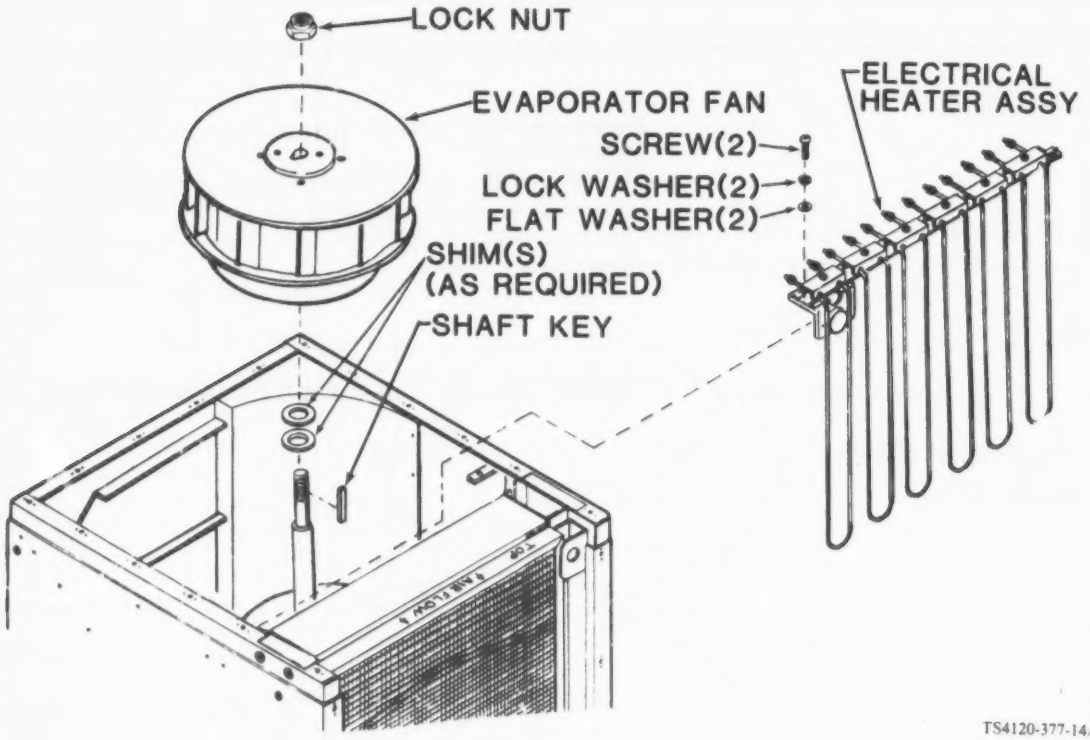

Figure 4-74. Evaporator Fan

a. Removal

(1) Check to see that power has been disconnected.

(2) Using screwdriver, remove two screws, lock washers, and flat washers that attach heater assembly to brackets.

(3) Carefully pull heater assembly up and out of unit.

(4) Using wrench, remove lock nut from end of motor shaft.

(5) Carefully pull evaporator fan up and off of motor shaft.

(6) Remove shaft key and shims (if applicable) or tape in place so that they will not be lost.

b. Inspection

(1) Check fan for dents, bent or loose fan blades, and that hub is securely attached. Replace if damaged.

(2) Check inlet bell for dents or any distortion that would cause interference with fans. Replace if damaged.

(3) If a motor problem is suspected, inspect or test motor in accordance with paragraph 4-63.

c. Clean

(1) Use a clean dry cloth and a soft brush to remove dirt from fan.

(2) If fan and inlet bell are excessively dirty, wash them with a mild detergent and water solution.

d. Evaporator fan inlet bell removal

CAUTION

Take care that hardware does not drop down into unit.

(1) Using screwdriver, remove four screws and lock washers.

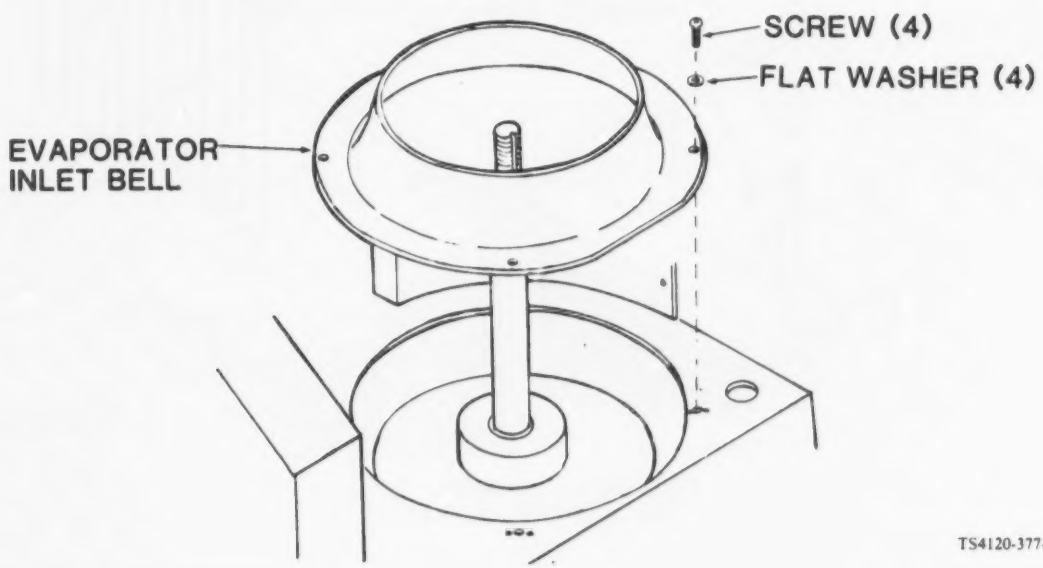

Figure 4-75. Evaporator Inlet Bell

(2) Lift inlet bell up and out of unit.

e. Evaporator inlet bell installation

(1) Place inlet bell in unit and aline mounting holes.

NOTE

Flat edge on inlet bell should be toward evaporator coil.

(2) Using screwdriver, secure inlet bell with four screws and flat washers.

f. Fan installation

(1) Check that shaft key is in place. If it is taped in place, remove tape.

(2) Aline keyway and shaft key and slip fan down onto motor shaft.

(3) Using shims (as required) between fan and shoulder on motor shaft, position fan on shaft so that there is 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between the fan and the inlet bell.

(4) Using wrench, install lock nut on end of shaft. Lock nut should be snug against fan.

(5) Spin fan by hand and check that there is still 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between fan and inlet bell. Adjust fan if necessary.

(6) Carefully place heater assembly into unit and aline mounting holes.

(7) Insert bottom of each heater element into retaining clips.

(8) Using screwdriver, secure heater assembly with two screws, lock washers, and flat washers.

Follow-on procedure: Install top cover. (See para 4-28.)

4-63. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN

Preliminary procedures: 1. Remove evaporator fan and evaporator fan inlet bell. (See para 4-62.)

2. Remove rear panel. (See para 4-32.)

3. Remove conditioned air filter. (See para 4-33.)

Special tool: 6 inch (15.2 cm) long arm hex "L" type key (allen wrench)

Personnel required: 2

a. Motor test (Installed)

(1) Check to see that power has been disconnected.

(2) Check motor for rotational freedom by spinning fan. If there is any stiffness or binding, contact direct support maintenance.

(3) Check motor bearings for shaft end play. If there is excessive end play, contact direct support maintenance.

(4) Electrically test motor as follows:

- Disconnect motor cable connector (P12).
- Use a multimeter set on lowest OHMS scale to check continuity between pins A and B, A and C, and B and C in motor connector (J12). If there is no continuity between any pair of pins, the motor winding is open. Replace motor.
- Use a multimeter set on high OHMS scale to test stator insulation by checking between each pin in connector (A, B, and C) and motor housing. A reading of less than 500,000 ohms indicates insulation failure. Replace motor.

NOTE

If all of the above inspections and tests are satisfactory, but the motor will still not operate properly, notify direct support maintenance, who may desire to make further tests before the motor is removed.

b. Fan inspection (Installed)

(1) Check fan for dents, bent or loose fan blades, and that hub is securely attached. Replace if damaged.

(2) Check inlet bells for dents or any distortion that would cause interference with fans. Replace if damaged.

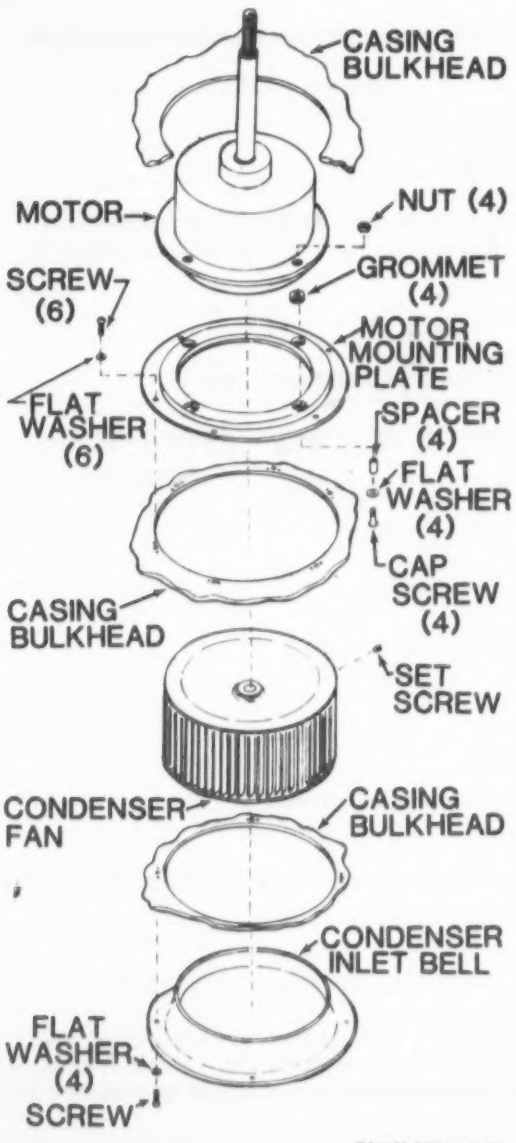

Figure 4-76. Evaporator and Condenser Fan Motor and Condenser Fan

c. Removal

(1) Using screwdriver and wrench, remove six screws and lock nuts from handle and handle enclosure on right side of unit.

(2) Remove handle and enclosure.

(3) Looking into condenser fan discharge opening, rotate fan and locate the two setscrew access notches through fan blades.

(4) Using special tool, 6 inch (15.2 cm) long arm hex "L" type key (allen wrench), loosen two setscrews until they are flush with outside of hub.

(5) Note position of motor junction box for reassembly.

(6) Mark motor and motor mounting plate for alinement at reassembly.

CAUTION

Take care that hardware does not drop down into unit.

(7) Using screwdriver, remove six screws and flat washers from motor mounting plate.

(8) Using wrench, remove four nuts from top of motor mounting flange.

WARNING

The following steps require two people.

(9) Lift motor high enough to gain access to mounting plate hardware.

(10) Using wrench, remove four cap screws, flat washers, and spacers from motor and motor mounting plate.

(11) Carefully slip fan down and off of motor shaft.

(12) Carefully lift motor up and out of top of unit.

(13) Slide motor mounting plate out of rear opening.

CAUTION

The condenser fan is easily damaged. Use care when removing fan not to damage fan or tubing insulation.

(14) Lift fan up and out of top of unit.

d. Clean

(1) Use a clean dry cloth and a soft brush to remove dirt from motor and fan.

(2) If fan and inlet bell are excessively dirty, wash them with a mild detergent and water solution.

e. Installation (See figure 4-76.)

CAUTION

The condenser fan is easily damaged. Use care when installing fan not to damage fan or tubing insulation.

(1) Carefully insert condenser fan into housing. Open end of fan must face down.

WARNING

The following steps require two people.

(2) Insert motor mounting plate into position with the insulation side facing up.

(3) Position motor into unit. Take care that fan is not damaged.

(4) Lift motor high enough to allow assembly of motor to motor mounting plate hardware.

(5) Be sure four grommets are in place on motor mounting plate.

(6) Aline marks on motor and motor mounting plate made at disassembly. (See para 4-63 c. (6) above.)

(7) Using wrench, secure motor mounting plate with four cap screws, spacers and flat washers.

(8) Using wrench, install four nuts on top of motor mounting cap screws.

(9) Slip fan onto motor and set motor into position on fan housing.

(10) Looking into condenser fan discharge opening, rotate fan and locate the two setscrew access notches through fan blades.

(11) Slip fan down on motor shaft far enough to determine locations of the two flats on the motor shaft.

CAUTION

The two setscrews MUST aline with the two flats on motor shaft.

(12) Aline setscrews with flats on motor shaft.

(13) Carefully slip fan up and tighten setscrews using special tool, 6 inch (15.2 cm) long arm hex "L" type key (allen wrench).

(14) Position motor junction box the same as before. (See para 4-63 c. (5) above.)

(15) Using screwdriver, secure motor mounting plate to casing with six screws and flat washers.

CAUTION

Do not loosen setscrews far enough to allow them to slip off of flats.

(16) Using special tool, 6 inch (15.2 cm) long arm hex "L" type key (allen wrench), SLIGHTLY loosen two setscrews in condenser fan hub.

(17) Position fan on shaft so that there is 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between the fan and the inlet bell.

(18) Tighten setscrews.

(19) Spin fan by hand and check that there is still a 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between fan and inlet bell. Adjust fan if necessary.

(20) Using screwdriver and wrench, install handle and enclosure using six screws and lock nuts.

Follow-on procedures:
1. Install conditioned air filter. (See para 4-33.)
2. Install rear panel. (See para 4-32.)
3. Install evaporator fan inlet bell and evaporator fan. (See para 4-62.)

4-64. EVAPORATOR COIL CLEANING

Preliminary procedures: 1. Remove mist eliminator. (See para 4-35.)

2. Remove evaporator fan. (See para 4-62.)

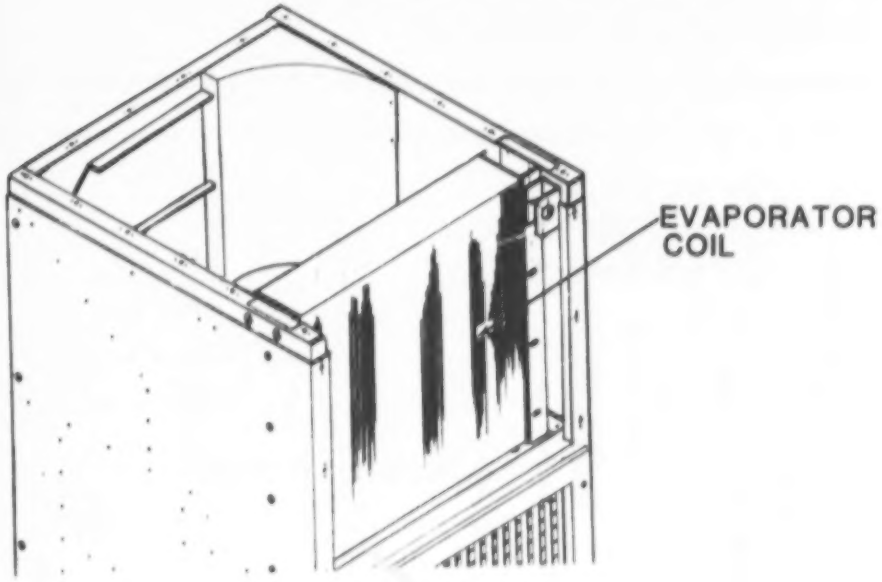

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Figure 4-77. Evaporator Coil

a. Inspection of installed coil

(1) Check to be sure that power is disconnected.

(2) Check for accumulated dirt. Clean if an accumulation of dirt is evident.

(3) Check fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm²).

CAUTION

Do not use steam to clean coil.

b. Cleaning. Clean coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

c. Repair/Replacement. Should a leak or major damage be evident, refer to direct support maintenance.

Follow-on procedures: 1. Install mist eliminator. (See para 4-35.)

2. Install evaporator fan. (See para 4-62.)

4-65. CONDENSER COIL CLEANING

Preliminary procedures: 1. Remove junction box. (See para 4-46.)

2. Remove condenser coil guard. (See para 4-26.)

3. Remove radio frequency filter. (See para 4-44.)

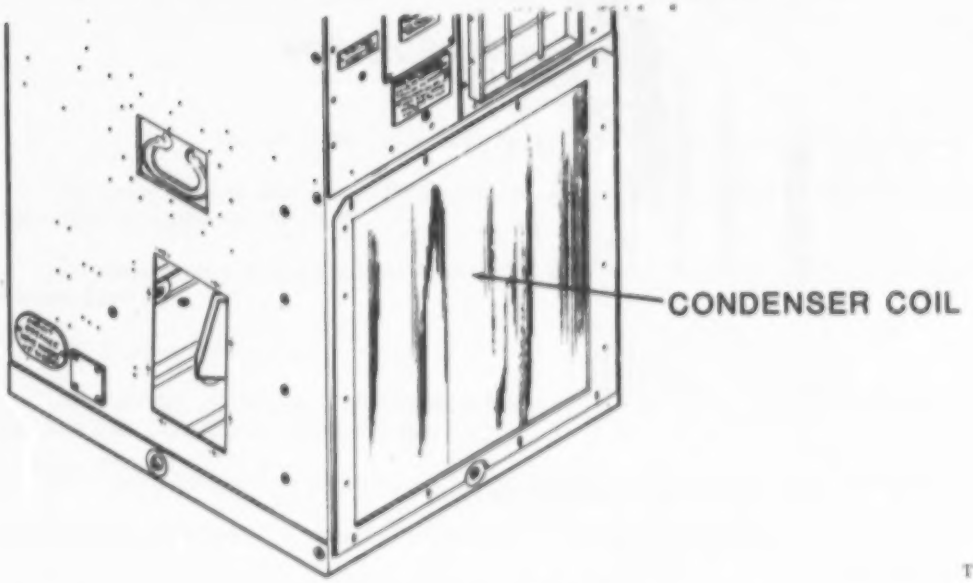

Figure 4-78. Condenser Coil

a. Inspection of installed coil

(1) Check to be sure that power is disconnected.

(2) Check for accumulated dirt. Clean if an accumulation of dirt is evident.

(3) Check fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm²).

CAUTION

Do not use steam to clean coil.

b. Cleaning. Clean coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

c. Repair/Replacement. Should a leak or major damage be evident, refer to direct support maintenance.

Follow-on procedure: 1. Install condenser coil guard. (See para 4-26.)

2. Install junction box. (See para 4-46.)

3. Install radio frequency filter. (See para 4-44.)

4-86. CONDENSATE TRAPS

Preliminary procedure: Remove junction box. (See para 4-46.)

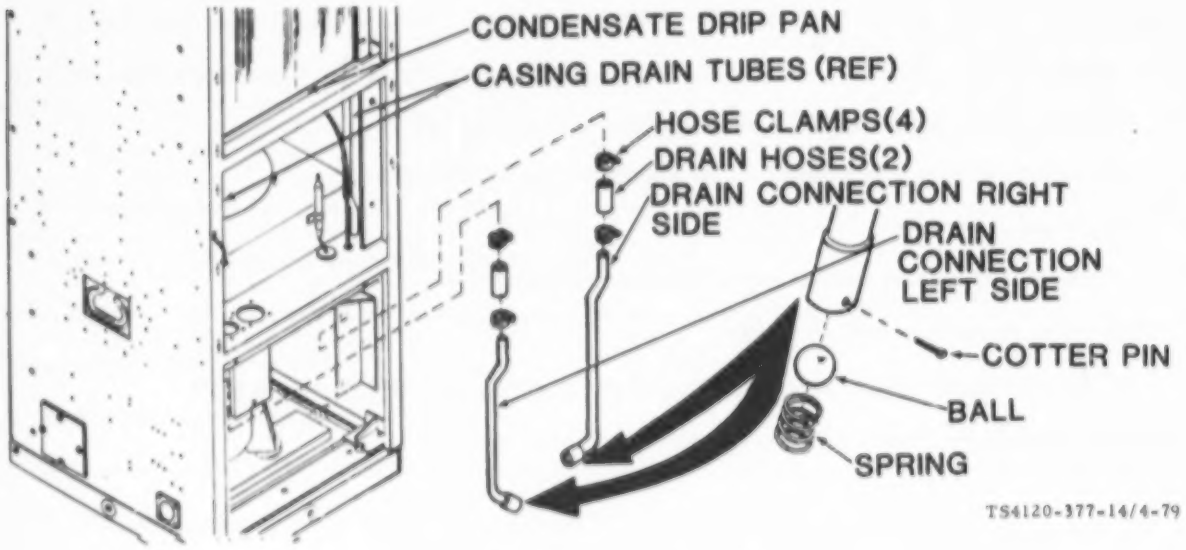

Figure 4-79. Condensate Drain Traps

a. Removal

(1) Disengage drain connection tubes from spring retainers on casing sides.

(2) Using screwdriver, loosen top hose clamps on drain hoses.

(3) Slip hoses down and off of casing drain tubes.

(4) Using pliers, remove cotter pins.

(5) Remove springs and balls from drain ends.

b. Inspection

(1) Check balls, springs, and cotter pins for nicks and wear.

(2) Replace balls if they are nicked or have any damage that would keep them from sealing properly.

(3) Replace springs if they are worn or have any damage that would keep them from applying pressure to balls.

c. Cleaning

Preliminary procedure: Remove mist eliminator. (See para 4-35.)

(1) Pour some clean fresh water into condensate drip pan.

(2) If water does not flow out of the ends of the drain tubes or has a muddy appearance, insert a flexible wire up the drain tube. Agitate until clog and accumulated debris are loose.

(3) Pour additional water in the drip pan until an unrestricted flow of clean water pours from the ends of the drain tubes.

(4) Be sure the springs, balls, and ball seats (end of drains where balls and springs are inserted) are clean.

Follow-on procedure: Install mist eliminator. (See para 4-35.)

d. Installation

(1) Insert balls and springs. Be sure that balls are above springs.

(2) Depress springs with screwdriver far enough to install cotter pins.

(3) Secure cotter pins.

(4) Slip drain hoses up and in place on casing drain tubes.

(5) Using screwdriver, secure clamps.

(6) Secure (push in place) drain connection tubes in spring retainers on casing sides.

Follow-on procedure: Install junction box. (See para 4-46.)

Section VII PREPARATION FOR STORAGE OR SHIPMENT

4-67. PREPARATION FOR STORAGE

a. Administrative storage of equipment. See TM 740-90-1. Administrative storage is short term storage — 1 to 45 days. It covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The administrative storage site should provide required protection from the elements and allow access for visual inspection when applicable.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

b. Intermediate storage — 46 to 180 days. No special handling is required other than protection from damage and the elements.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

(3) Place the air conditioner in a dry, covered area.

c. Long term or flyable storage. There is no time limit for this type of storage.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

(3) Bolt the unit to a skid base, preferably the original used to ship the unit if it has been preserved.

(4) Wrap the unit with two layers of heavy plastic sheet or barrier paper.

(5) Tape and strap the wrapping in place.

(6) Mark the air conditioner per standard Army procedures.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. GENERAL

a. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. Test, Maintenance, and Diagnostic Equipment (TMDE) and support equipment include electrical test equipment, standard pressure and vacuum gages, vacuum pumps, and charging manifolds found as standard equipment in any direct support refrigeration shop.

c. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, (RPSTL), TM 5-4120-377-24P, covering organizational, direct support, and general support maintenance for this equipment.

d. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-596-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	National Stock Number
Soldering Gun Kit	3439-00-930-1638
Vacuum Pump	4310-00-098-5272

Section II MAINTENANCE PROCEDURES

5-2. AIR CONDITIONER (FABRIC) COVER

For removal, inspection, lubrication, cleaning, and installation, see paragraph 4-18 and figure 4-22.

a. Repair. Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface.

b. Replace. For damage of greater extent, or missing eyelets or snap fasteners, replace the entire cover.

5-3. OUTSIDE COVERS, PANELS, GRILLES, SCREENS, INFORMATION PLATES

a. For removal, inspection, cleaning, and installation, see the following paragraphs:

- CBR (Chemical, Biological, Radiological) duct cover (see para 4-19.)
- Access (service valves) cover (See para 4-20.)
- Connector cover plates (See para 4-21.)
- Side access plate (See para 4-22.)
- Conditioned air discharge (outlet) grille assembly (See para 4-23.)
- Conditioned air intake grille assembly (See para 4-24.)
- Condenser (fan) guard (See para 4-25.)
- Condenser coil guard (See para 4-26.)
- Fresh air (inlet) screen (See para 4-27.)
- Top panel (See para 4-28.)
- Lower front panel (See para 4-29.)
- Access panel (circuit breaker) (See para 4-30.)
- Filter (radio frequency) mounting plate (See para 4-31.)
- Rear panel (See para 4-32.)

b. Repair. Repairs are limited to straightening of minor dents, rewelding of broken welds, installation of loose or missing rivets, replacement of loose or missing gaskets and insulation, paint touch up, and replacement of damaged or missing name plates.

(1) Repair minor dents using standard sheet metal repair practices.

(2) Repair broken welds using standard weld repair practices.

(3) To replace loose or missing rivets:

- Drill old rivet out using a drill bit slightly smaller than the diameter of old rivet body.
- Install replacement rivet.

(4) To replace or repair gasket or insulation:

• Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

• Soften and remove old adhesive and gasket and insulation residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

• Coat the mating surfaces of the metal and gasket or insulation (if applicable) with adhesive, item 3, Appendix E. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

• Starting with an end, carefully attach the gasket to the metal. Press into firm contact all over.

(5) Should touch up or refinishing be necessary, see TM 43-0139, Painting Instructions for Field Use.

(6) To replace damaged or missing name plates:

• Drill rivets out using a drill bit slightly smaller than the diameter of the rivet body.

• Secure new name plate with replacement rivets.

5-4. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR KECO MODEL F18T4-2S

Preliminary procedure: Remove motor. (See para 4-63.)

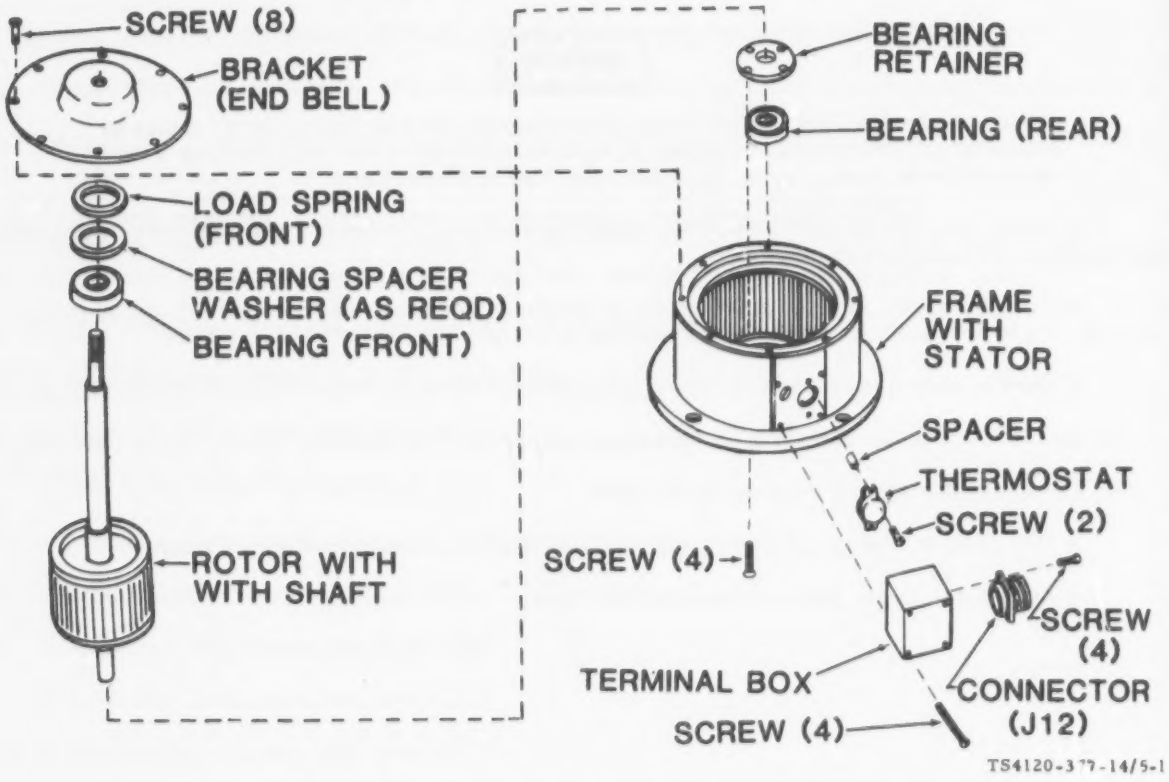

Figure 5-1. Evaporator and Condenser Fan Motor (KECO Model F18T4-2S)

See paragraph 4-63 for testing (installed), removal, and installation.

a. Authorized repairs. Direct support maintenance repair of the fan motor is limited to the replacement of electrical plug, thermostat (thermal overload), bearings, rotor with shaft, and hardware items.

b. Disassembly. Disassemble motor only as necessary to do required repair. (See figure 5-1.)

(1) To replace connector (J12):

(a) Using screwdriver, remove four screws from terminal box.

(b) Remove terminal box.

(c) Remove four screws from connector (J12).

(d) Pull connector away from terminal box as far as wires will allow.

(e) Tag and unsolder leads.

(f) Remove old connector.

(g) See wiring diagram and tags and solder leads to new connector.

(h) Remove tags.

(i) Using screwdriver, secure connector to terminal box with four screws.

(j) Using screwdriver, secure terminal box to motor with four screws.

(2) To replace thermostat (thermal protector):

(a) Using screwdriver, remove four screws from terminal box.

(b) Pull terminal box away from motor as far as connector wires will allow.

(c) Using screwdriver, remove two screws and spacers.

(d) Pull thermostat away from motor.

(e) Tag and disconnect leads to the thermostat.

(f) Remove old thermostat.

(g) See tags and connect leads to new thermostat.

(h) Remove tags.

(i) Using screwdriver, secure thermostat with two screws and spacers.

(j) Using screwdriver, secure terminal box with four screws.

(3) To replace bearings:

(a) Match-mark motor frame and bracket (end bell) to ease reassembly.

(b) Using screwdriver, remove eight screws from bracket (end bell).

(c) Using screwdriver, remove four screws from bearing retainer.

(d) Carefully separate bracket (end bell) from motor frame.

(e) Carefully pull rotor with shaft and bearings from the frame with stator.

(f) Note the position and number of load spring, bearing spacer washer(s), bearings, and bearing retainer as they are removed.

(g) Check spacer washers and load spring for excessive wear, nicks, or breakage. Replace them if they are damaged.

WARNING

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for assembly.

(h) Remove bearings.

(i) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(j) Dress high metal defects in shafts with a fine file or stone. If shaft is beyond repair, replace rotor and shaft.

(k) Check bearing retainer for visible damage. Replace it if screw threads are stripped or it is broken or cracked.

(l) Examine motor frame with stator for broken flange, stripped threads, visible damage, shorted windings (para 4-63), and evidence of overheating. If motor frame with stator is beyond repair, replace motor.

(m) Coat shaft surfaces with oil (MIL-L-2104, Grade 20) or equal.

(n) Install new bearings on shafts. Be sure that bearing retainer is in place on shaft prior to installing (rear) bearing.

(o) Coat the bearing cavity of bracket (end bell) with oil (MIL-L-2104, Grade 20) or equal and insert spacer washers, bearing loading springs, and bearings in same location as removed in step (f) above.

(p) Insert rotor and shaft, with bearing retainer and bearing (rear) in place into frame with stator.

(q) Carefully work bracket (end bell) onto shaft end keeping the match-marks made at time of disassembly in alinement.

(r) Aline bearing retainer threaded holes.

(s) Using screwdriver, secure bearing retainer with four screws.

(t) Using screwdriver, secure bracket (end bell) with eight screws. Before final tightening, check for freedom of rotation by turning shaft by hand. There should be no drag or binding. Correct as necessary and tighten screws. Check again for binding and drag.

(u) Check end-play of shaft. End-play should be 0.002-0.005 inch (0.051-0.127 mm). If end-play is not within limits, disassemble motor and add or remove bearing spacer washers to adjust. Check again for binding or drag.

Follow-on procedure: Install motor. (See para 4-63.)

5-4.1 EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR APPLIED MODEL 3788

Preliminary procedure: Remove Motor. (See para 4-63.)

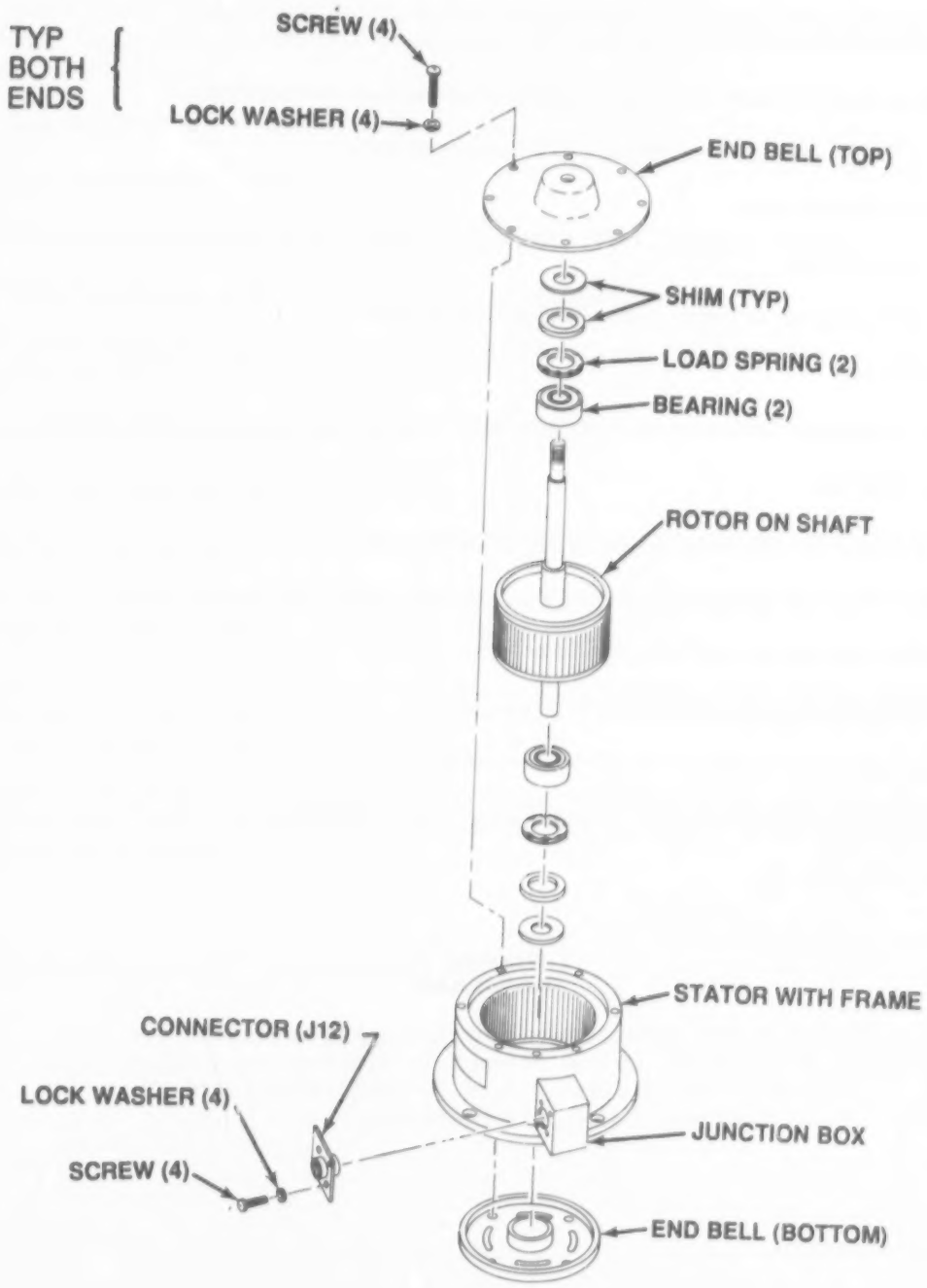

Figure 5-1.1. Evaporator and Condenser Fan Motor (APPLIED MODEL 3788)

a. Authorized repairs. Direct support maintenance repair of the fan motor is limited to the replacement of electrical connector, bearings, rotor with shaft, and hardware items.

b. Disassembly. Disassemble motor only as necessary to do required repair.

(1) To replace connector (J12):

(a) Using screwdriver, remove four screws and four lock washers from connector.

(b) Pull connector away from terminal box as far as wire will allow.

(c) Tag and unsolder leads.

(d) Remove connector.

(e) See wiring diagram and tags. Solder leads to new connector.

(f) Remove tags.

(g) Using screwdriver, secure connector to terminal box with four screws and four lock washers.

(2) To replace bearings:

(a) Match-mark frame and two end bells for ease of reassembly.

(b) Using screwdriver, remove eight screws and eight lock washers from two end bells.

(c) Carefully separate two end bells from motor frame.

(d) Carefully pull rotor with shaft and bearings from frame.

(e) Note position and number of load springs and shims.

(f) Check shims and load springs for excessive wear, nicks, or breakage.

Replace if damaged.

WARNING

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for assembly.

(g) Remove bearings.

(h) Examine rotor, stator, and shafts for nicks, gauges, deformation and evidence of overheating.

(i) Dress high metal defects in shafts with a fine file or stone. If shaft is damaged beyond repair, replace rotor and shaft.

(j) Examine motor frame with stator for broken flange, stripped threads, visible damage, shorted windings (Para 4-63) and evidence of overheating. If motor frame with stator is damaged beyond repair, replace motor.

(k) Coat shaft surfaces with oil (MIL-L-2104) or equal.

(l) Install new bearings on shafts.

(m) Coat the bearing cavities of two end bells with oil (MIL-L-2104, Grade 20) or equal.

(n) Install load springs and shims in same location as removed in step (e) above.

(o) Carefully install rotor and shaft (bearing, load spring and shims installed on shaft) in bearing cavity of bottom end bell.

(p) Install this assembly in stator with frame.

(q) See match-marks and align end bell with frame.

(r) Using screwdriver, secure bottom end bell to frame with four screws and four lock washers.

(s) Carefully work top end bell on shaft (bearing load spring, shims installed on shaft) to fit bearing cavity of top end bell. Rotate top end bell to align match-marks.

(t) Using screwdriver loosely secure top end bell to frame with four screws and four lock washers. Rotate shaft by hand. There must be no drag or binding. Correct as necessary and tighten screws. Recheck for binding and drag.

(u) Check end-play of shaft. End-play should be 0.002-0.005 inches (0,051-0,127mm). If end-play is not within limits, disassemble motor and add or remove shims as needed. Check again for binding or drag. Correct as needed.

Follow-on procedure: Install motor. (See para 4-63.)

5-5. REFRIGERATION SYSTEM REPAIRS GENERAL

The refrigeration system must be totally discharged before any maintenance action that requires opening of the pressurized system. Leak testing and dehydrator replacement are required after any system component has been removed and replaced. The system must be evacuated before it is charged. The system must be properly charged to function properly.

WARNING

DANGEROUS CHEMICAL
(R22)
is used in this equipment.

DEATH
or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible. Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes refrigerant to break down and from carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment

DEATH
or severe injury may result if you fail to observe safety precautions.
Never use a heating torch on any part that contains refrigerant -22.
Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

5-6. DISCHARGING THE REFRIGERANT SYSTEM

a. Using screwdriver, remove four screws and flat washers from service valve access cover.

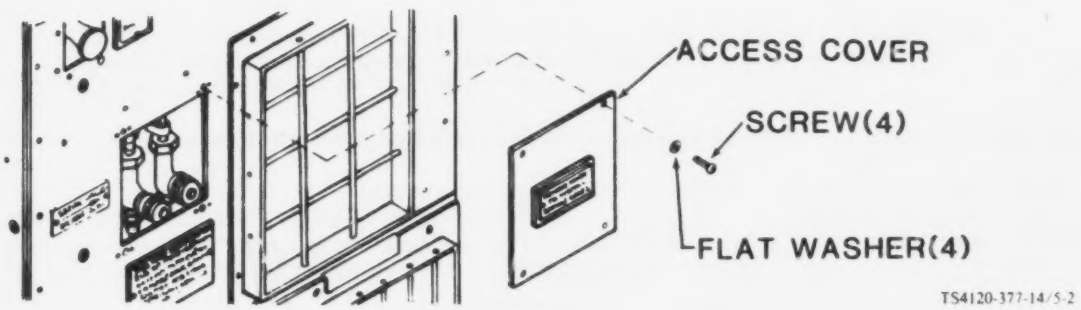

Figure 5-2. Access (Service Valves) Cover

b. Remove service valve access cover.

c. Unscrew hose connection protective caps.

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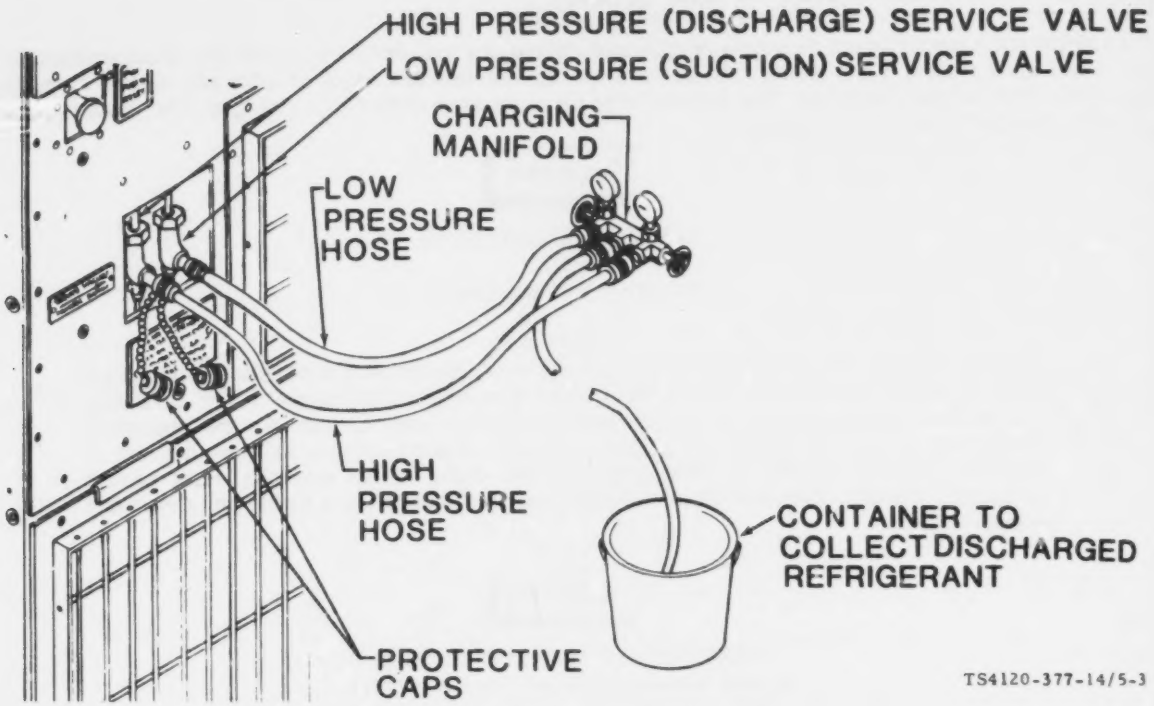


Figure 5-3. Discharging Refrigerant

WARNING

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

d. Connect the charging manifold hoses to the manifold and air conditioner service valves.

e. Attach a hose assembly to the center connection of the manifold.

f. Place the open end of the center connection hose in a container that is located in a well ventilated area.

WARNING

Discharge refrigerant in an open area and *not* around an open flame.

CAUTION

Do not permit the oil to escape from the unit. If oil is escaping, close the valve(s) slightly.

Do not permit the refrigerant to escape fast enough to form ice or frost on either the lines or the valve.

g. Using a refrigeration wrench, *slowly* open the low pressure service valve to allow refrigerant gas to flow *slowly* out of the hose.

h. Using a refrigeration wrench, *slowly* open the high pressure service valve to allow refrigerant gas to flow *slowly* out of the hose.

i. Check the discharge hose for the presence of oil. Adjust (close slightly) valves if necessary to prevent oil discharge.

j. When gas stops flowing, close both service valves.

5-7. PURGING THE REFRIGERANT SYSTEM

Preliminary procedure: Discharge the refrigerant system. (See para 5-6.)

Supplies: Nitrogen cylinder (item 4, Appendix E)

The refrigeration system must be purged with dry nitrogen, item 4, Appendix E, before any brazing is performed on any component. A flow of dry nitrogen at the rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

CAUTION

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations.

CAUTION

Nitrogen is an inert gas. However, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

Assuming that the system has been discharged using a manifold as described in paragraph 5-6, proceed as follows:

a. See specific component removal/repair instructions.

b. Be sure that refrigerant has been discharged. (See paragraph 5-6.)

c. Connect the center hose from the charging manifold to a nitrogen regulator and dry nitrogen tank.

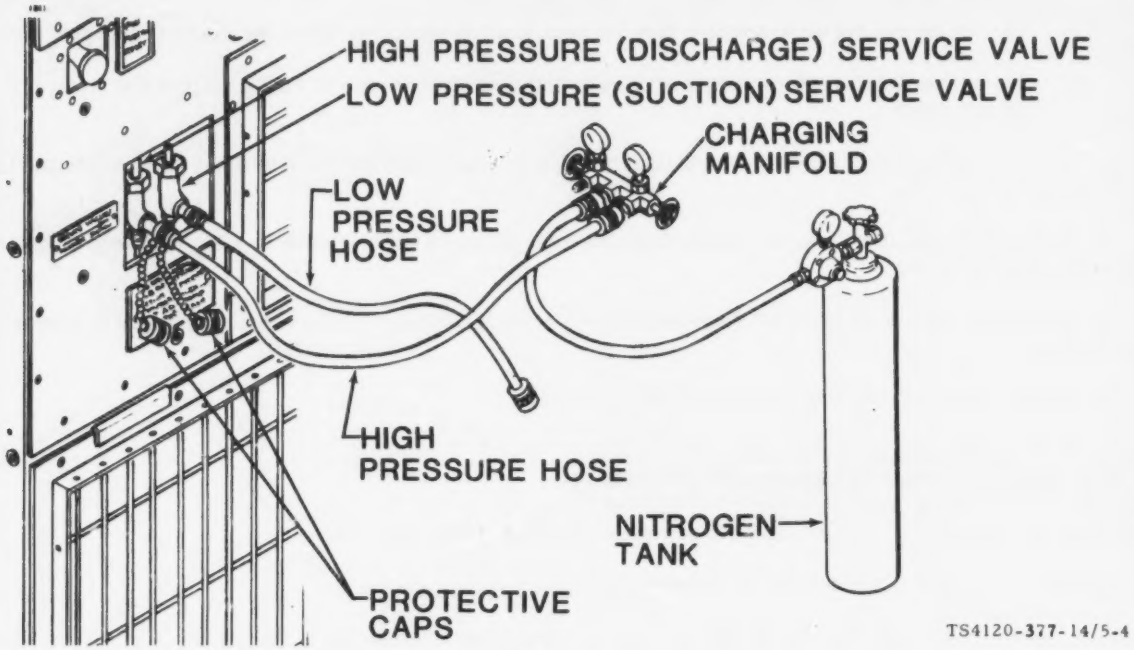


Figure 5-4. Nitrogen Purging Connection

d. The hose from the high pressure service valve to the charging mainfold must be connected.

e. The hose from the low pressure service valve must be disconnected from the charging manifold.

f. Open both service valves on the unit.

g. Close the unused valve on the charging manifold, and open the one with the nitrogen tank hook up.

h. Open the nitrogen cylinder valve and adjust the regulator so that less than 1-2 cfm (0.028-0.057 m^3/minute) of nitrogen flows through the system.

i. Check discharge from hose attached to the low pressure charging valve to be sure that no oil is being forced out of the system.

j. Allow nitrogen to sweep through the system at the rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute) for a minimum of 5 minutes, before starting any brazing operation. Then allow it to continue to flow at the same rate until all brazing operations are completed. (See paragraph 5-8 for brazing/debrazing procedures.)

k. After installation brazing operations are completed, allow nitrogen to flow for a minimum of 5 minutes.

l. Close nitrogen cylinder valve, nitrogen regulator, charging manifold valve, and both high and low pressure service valves on the unit.

m. Disconnect the hose from the nitrogen tank.

n. Assuming that all repairs are completed, go to paragraph 5-9.

5-8. BRAZING/DEBRAZING PROCEDURES

Supplies: Brazing alloy (silver) (items 5 and 6, Appendix E)

Nitrogen cylinder (item 4, Appendix E)

Brazing flux (item 7, Appendix E)

Abrasive cloth (item 8, Appendix E)

Rags (item 9, Appendix E)

a. General. All tubing in the refrigeration system is seamless copper with a bright internal finish that permits thorough cleaning and prevents entrapment of moisture or other impurities. Rigid grade copper is used for straight sections and soft grade for sections that must be bent. All interconnecting fittings, such as elbows, tees, etc., are also copper. The bodies of all valves and all connections on other components are brass. All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

b. Filler Alloy. Grade IV or VI brazing alloy and Type B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade III brazing alloy may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints.

c. Debrazing. Debraze joints for removal of refrigeration system components as follows:

WARNING

All refrigerant-22 must be discharged from system and entire system must be purged with dry nitrogen before beginning any debrazing operation.

(1) Determine which joints are to be debrazed. Due to the limited work space inside the air conditioner, it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing the joints on the component itself.

(2) Before debrazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet rag to act as a heat sink.

WARNING

Polyurethane foam used as insulation in air conditioner will break down to form toxic gases if exposed to flame of a torch at brazing temperature.

(3) Protect insulation, wiring harnesses, cabinet, and other surrounding components with appropriate shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.

d. Cleaning debrazed joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a damp cloth.

Be sure no filler alloy or other debris are left inside any tubing, fitting, or component.

e. Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new component before reinstallation.

f. Brazing. Braze joints within the air conditioner as follows:

(1) Position the component to be installed.

(2) To prepare a joint on a valve for brazing, disassemble the valve to the extent possible. Then wrap all but the joint with a wet rag to act as a heat sink.

(3) Protect insulation, wiring harnesses, and surrounding components with appropriate shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove heat as soon as brazing is completed.

5-9. LEAK TESTING THE REFRIGERANT SYSTEM

Supplies: Nitrogen cylinder (item 4, Appendix E)

Refrigerant 22 (item 10, Appendix E)

a. The entire repaired area should be thoroughly leak tested after repair or replacement of any component, before it is recharged with refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

b. Testing Method. There are two acceptable methods for leak testing the refrigeration system.

(1) Refrigerant gas leak detector. If an electronic refrigerant gas leak detector is available it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas."

NOTE

The electronic refrigerant gas leak detector is highly sensitive to the presence of a minute quantity of gas in the air, and due to this factor is quite effective in the detection of small leaks. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area.

(2) Soap solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of possible leakage while closely watching for the formation of bubbles.

CAUTION

If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation.

c. Testing procedures. To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas. To perform leak testing by use of the soap solution method, the system may be pressurized with dry nitrogen alone.

(1) To pressurize a system that has some refrigerant charge, for either leak testing method:

(a) Remove the hose connection protective caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.

NOTE

If it is possible that the problem may not be a leak and that you may not have to replace a refrigeration system component, refrigerant-22 may be substituted for the nitrogen in the following test. If nitrogen is used, you will have to discharge, evacuate, and recharge the system after this test is completed.

(c) Connect a nitrogen pressure regulator and nitrogen bottle to the center hose connection of the charging manifold.

(d) Open the unit service valves and the charging manifold valves.

(e) Open the nitrogen tank valve and pressurize the system to 350 psi (24.7 kg/cm^2).

(f) Perform leak tests.

(g) If a leak is found, discharge and purge the system and repair leak. See specific instructions for components to be removed.

(h) If a leak was not found and refrigerant-22 was used to pressurize the system, see charging instructions. (See para 5-11.)

(2) To pressurize a system that has been discharged and purged for leak testing with an electronic detector:

(a) Remove the hose connection protective caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.

(c) Connect a drum of refrigerant-22 to the center hose connection of the charging manifold.

CAUTION

Connect the refrigerant-22 drum so that only *gas* will be used for pressurization.

(d) Open both unit service valves and the charging manifold valves.

(e) Open the refrigerant drum valve slightly and adjust as necessary to prevent formation of frost, and allow system pressure to build up until the gages read 40-50 psi (2.8 - 3.5 kg/cm^2).

(f) Close the charging manifold valves and the refrigerant drum valve.

(g) Remove the refrigerant-22 drum from the center hose connection.

(h) Connect a nitrogen regulator and cyclinder of dry nitrogen to the center hose connection.

(i) Open the charging manifold valves and the nitrogen cylinder and regulator valve. Allow system pressure to build up until gages read 350 psi (24.7 kg/cm^2).

(j) Perform leak tests, then discharge and purge the system, in accordance with paragraphs 5-6 and 5-7 before performing maintenance, or before evacuating and charging the system, as appropriate.

(3) Final leak testing. Always perform a final leak test after performing any repair or replacement of components before the air conditioner is reassembled and the refrigeration system is evacuated and charged.

5-10. EVACUATING THE REFRIGERANT SYSTEM

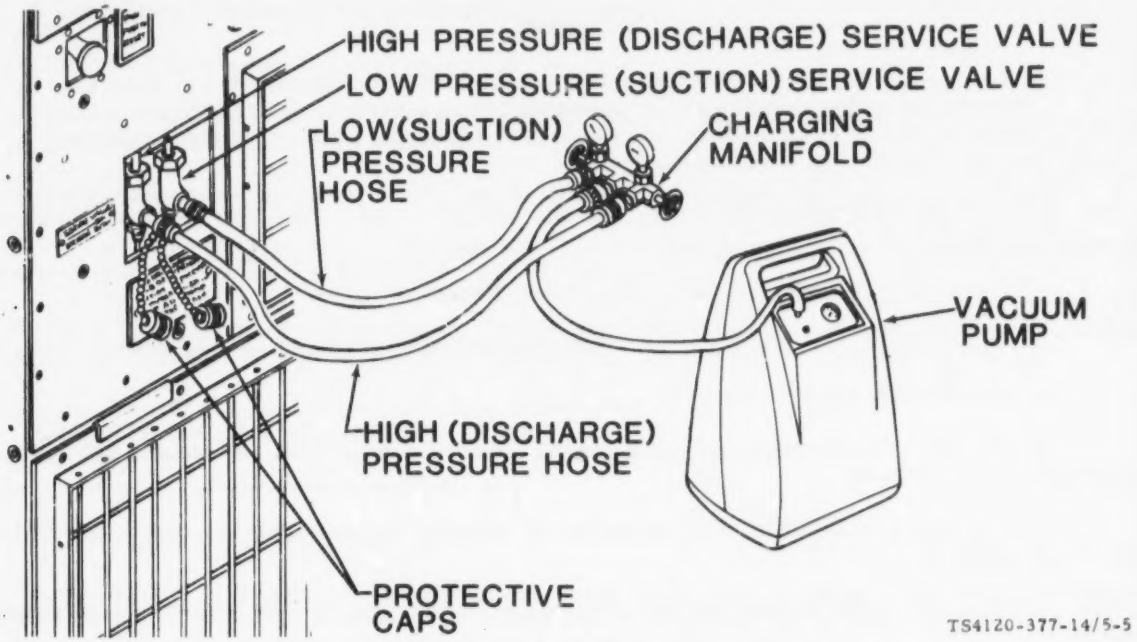


Figure 5-5. Evacuation of Refrigeration System

The refrigeration system must be evacuated to remove all moisture before it is charged with refrigerant-22.

CAUTION

Don't evacuate a leaking system. The vacuum created can cause air, moisture, and dirt to enter system.

a. Check that system was leak tested and has NO LEAKS.

NOTE

In the event that the compressor was replaced as result of a burn out, check that compressor burn out procedures were followed. (See para 5-20.)

b. Check that new filter-drier was installed. If not, install one.

c. Check that both service valves and charging manifold valves are closed.

d. Attach hose assemblies to service valves and charging manifold valves.

e. Attach center hose assembly to vacuum pump.

f. Start vacuum pump.

g. Open charging manifold valves.

h. Open both unit service valves.

i. Run the vacuum pump until at least 29 inches of mercury, measured on the gage, is reached.

NOTE

Inability to reach 29 inches of mercury may indicate either a leak or a problem with the pump.

j. Continue running the pump for one more hour, while observing the gage. If the gage needle moves back and forth, you have a leak which must be located and corrected first.

k. Close both unit service valves.

l. Close charging manifold valves.

m. Stop vacuum pump.

n. Disconnect pump from center hose connection.

o. Go to paragraph 5-11, charging the refrigeration system.

5-11. CHARGING THE REFRIGERATION SYSTEM

Supplies: Dehydrator

Refrigerant 22 (Drum) (item 10, Appendix E)

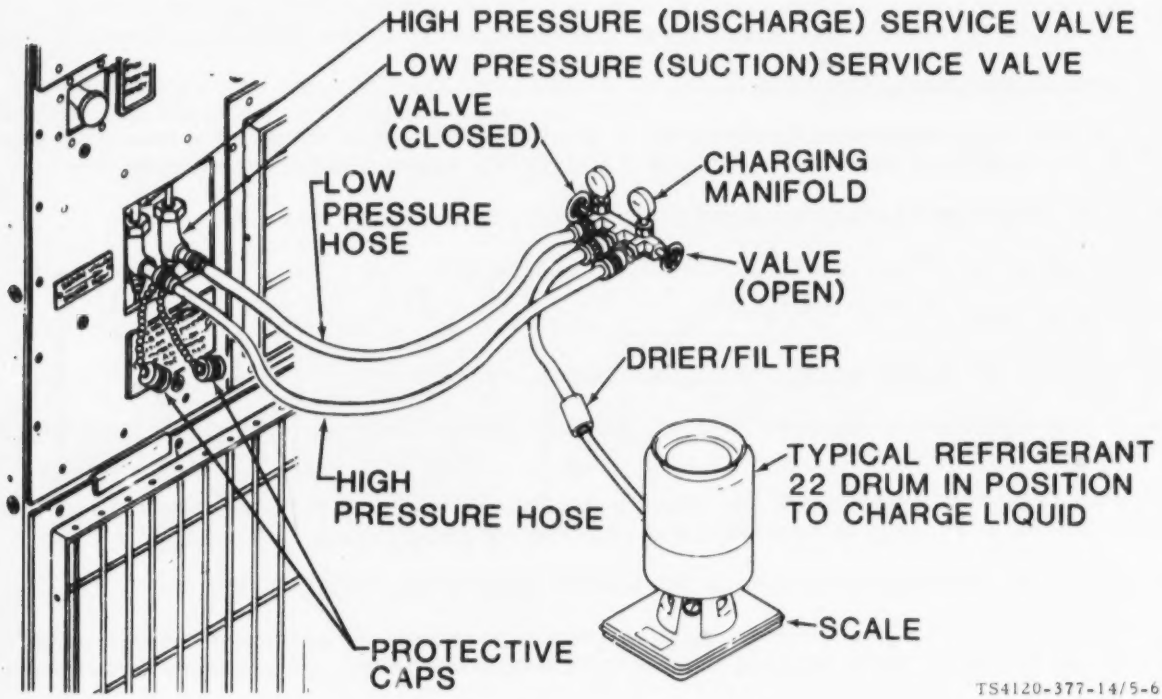


Figure 5-6. Refrigerant Charging

After the system has been satisfactorily evacuated, it must be fully charged with refrigerant-22.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) service valve.

NOTE

The system must be evacuated before charging. Use only refrigerant-22 to charge the unit.

a. Check that the hose from the low pressure service valve is connected to the compound gage side of the charging manifold. The hose from the high pressure service valve should be connected to the pressure gage side of the charging manifold.

b. Connect the center hose from the charging manifold to a well charged drum of refrigerant-22.

c. Loosen the hose connections to the two air conditioner service valves slightly.

d. Open the two charging manifold valves.

e. Open the refrigerant-22 drum valve slightly to allow a small amount of refrigerant to purge air from the hoses. Tighten the hose connections at the air conditioner service valves.

f. Close the low pressure (suction) charging manifold valve. *Never* introduce liquid refrigerant into the low pressure (suction) service valve.

g. Position the refrigerant-22 drum so that liquid will be used for charging. (Some drums must be inverted and some are equipped with a selector valve.)

h. Using accurate scales, measure and record the weight of the refrigerant-22 drum.

i. Open the refrigerant-22 drum valve.

j. Open the high pressure service valve on the air conditioner. Allow liquid refrigerant to enter the system until the drum weight has decreased by 4 pounds (1.8 kg) or until system pressure has equalized.

k. Close the refrigerant drum valve and the high pressure (discharge) manifold valve.

l. Connect air conditioner to a remote control module assembly.

m. Connect power.

n. Press and release both pressure switch reset buttons.

o. Turn air conditioner on and operate in the COOL mode with the TEMPerature control thermostat set at a maximum DECREASE position.

p. If the 4 pound (1.8 kg) full charge was obtained, skip steps p through s. If the system pressure equalized prior to obtaining a full charge of 4 pounds (1.8 kg), proceed with step p.

q. Switch the refrigerant drum to the *gas* only position.

r. Be sure that the refrigerant drum has been switched to the gas position and open the refrigerant drum valve, the low (suction) pressure charging manifold valve, and the low (suction) pressure service valve on the air conditioner.

s. Monitor the weight of the refrigerant drum as the air conditioner compressor pulls additional refrigerant *gas* into the system until the full 4 pound (1.8 kg) charge is obtained. When the system is fully charged, immediately close the air conditioner low pressure service valve and the refrigerant drum valve.

t. Run the air conditioner in COOL mode (with TEMPerature control thermostat in full DECREASE position) for 15 minutes.

CAUTION

Do not skip the next step.

u. After 15 minutes, observe the sight glass on back of condenser section.

- *Green center* means the refrigerant moisture content is acceptable.
- *Yellow center* means there is too much moisture in the system. It *must be discharged, evacuated, and charged again.*
- *Milky white or bubbly* liquid means the system has a low charge.
- *Clear bubble-free* liquid around the center means the system is fully charged.

v. If charge is *low*, add *gas* refrigerant.

(1) Be sure that drum is switched to *gas* position. Open the drum valve and the air conditioner low pressure service valve.

(2) Continue to charge until sight glass is clear and bubble-free.

(3) Close the air conditioner low pressure service valve and refrigerant drum valve.

w. Check air conditioner for proper cooling. There should be at least a 15°F temperature difference between evaporator discharge air and the inlet air. Turn the mode selector switch to OFF.

x. Assure that the high and low pressure air conditioner service valves are closed and remove the charging manifold hoses from the air conditioner service valves.

y. Install service valve protective caps.

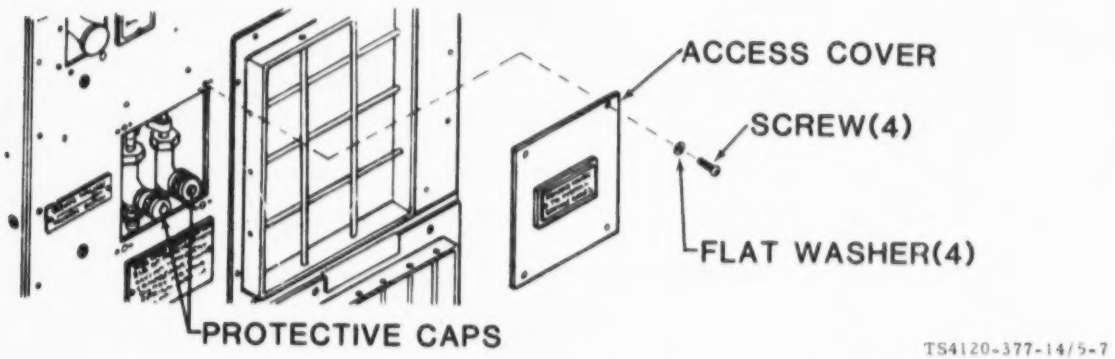


Figure 5-7. Service Valve Caps and Cover

z. Using screwdriver, secure service valve access cover with four screws and flat washers.

5-12. REFRIGERANT PRESSURE CHECK

Except in cases where it is obvious that the refrigerant charge has been lost, the first step in troubleshooting problems in the refrigeration system should be to check discharge and suction pressures under operating conditions. Check pressures as follows:

a. Turn the mode selector switch to OFF.

b. Using screwdriver, remove four screws and flat washers from service valve access cover.

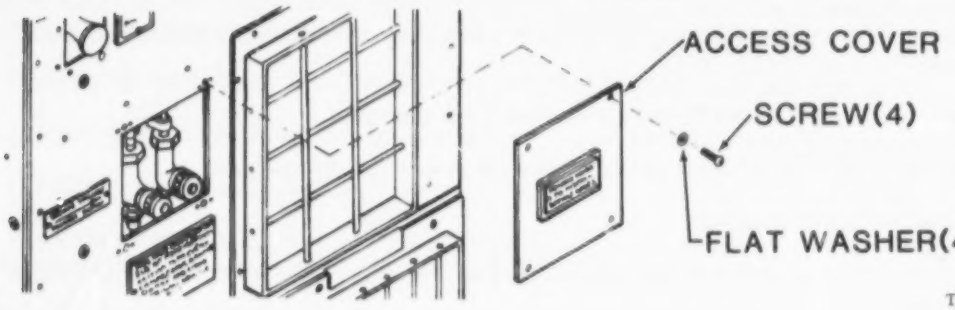


Figure 5-8. Access (Service Valves) Cover

c. Remove protective caps from service valves.

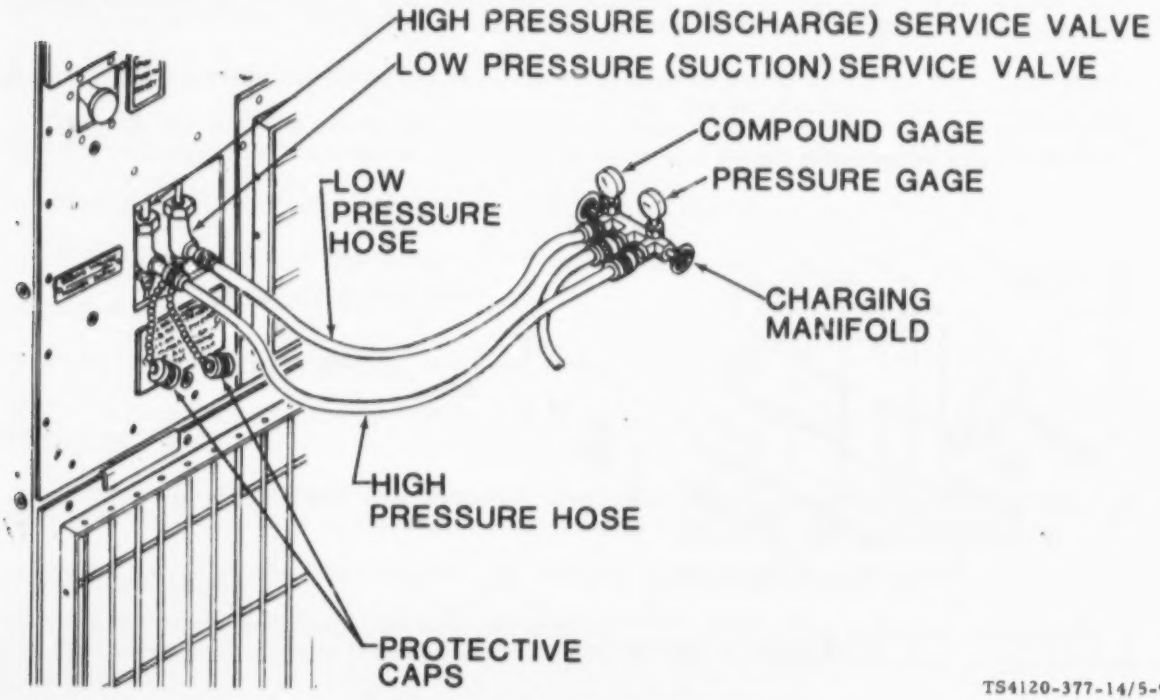


Figure 5-9. Pressure Test Connection

d. Connect individual pressure gages, or a refrigeration charging manifold and hoses to the high (discharge) and low (suction) service valves.

CAUTION

Take care that only a very small amount of refrigerant is allowed to escape during hose purging.

e. Loosen hose connections at gages or charging manifold.

f. Open high (discharge) high pressure service valve slightly to purge air from hose. Tighten high pressure hose connection at gage fitting as soon as a hissing sound is heard.

g. Open low (suction) pressure service valve slightly to purge air from hose. Tighten low pressure hose connection at gage fitting as soon as a hissing sound is heard.

h. Open the low (suction) and high (discharge) service valves.

i. Both gages should read the same. Check the reading with the appropriate column in table 5-1. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check; go to leak testing.

j. Turn the mode selector switch to the COOL mode with the TEMPerature control thermostat in the full DECREASE setting for a few minutes.

k. With the unit operating, allow gages to stabilize. Take readings of the two gages.

(1) Discharge pressure too high.

Possible causes:

- Dirty or partially blocked condenser coil.
- Partially blocked condenser fan discharge.
- Loose or missing lower front panel, connector cover plate, circuit breaker access cover, or filter mounting plate.
- Excessive recirculation of hot condenser discharge air back into condenser intake.
- Overcharge of refrigerant.
- Air in refrigerant system.
- High suction pressure — See (4) below.
- Fan motor not operating.
- Condenser fan loose on shaft.
- Too much oil in refrigerant system.

(2) Discharge pressure too low.

Possible causes:

- Cold outside air.
- Low refrigerant charge.
- Compressor not operating.

- Problem with equalizing solenoid valve.
- Problem with pressure regulating valve.
- Internal compressor damage.

(3) Suction pressure too low.

Possible causes:

- Dirty return air filter.
- Discharge or return air louvers closed.
- Partially blocked discharge or return air ducts or openings.
- Dirty evaporator coil.
- Cold return air.
- Low refrigerant charge.
- Liquid solenoid valve closed.
- Fan motor not operating.
- Evaporator fan loose on motor shaft.
- Problem with expansion valve operation.
- Expansion valve superheat too high.
- Plugged or kinked distributor tube.
- Suction line or evaporator coil tubing restriction.
- Clogged dehydrator (filter-drier).
- Moisture in refrigerant system.

(4) Suction pressure too high.

Possible causes:

- High return air temperature.
- Open equalizing solenoid valve.
- Compressor not running.
- Expansion valve bulb damage or poor contact with suction line.
- Internal compressor failure.
- Problem with liquid quench expansion valve.
- Problem with regulating valve.
- Problem with expansion valve.

l. When pressure tests are completed, proceed with the maintenance action indicated.

m. Turn unit OFF.

n. Close service valves on unit.

o. Remove gages or service manifold hoses from service valves.

p. Install service valve protective caps.

q. Using screwdriver, secure service valve access cover with four screws and flat washers.

Table 5-1. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT-22

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/em²	Deg F	Deg C	Psig	kg/em²
10	-12.3	32.93	2.315	66	18.9	114.2	8.029
12	-11.1	34.68	2.439	68	20.0	118.3	8.318
14	-10.0	36.89	2.593				
16	- 8.9	38.96	2.739	70	21.1	122.5	8.612
18	- 7.8	41.09	2.889	72	22.2	126.8	8.915
				74	23.3	131.2	9.225
20	- 6.6	43.28	3.043	76	24.4	135.7	9.541
22	- 5.5	45.23	3.180	78	25.6	140.3	9.864
24	- 4.3	47.85	3.364				
26	- 3.4	50.24	3.532	80	26.7	145.0	10.195
28	- 2.2	52.70	3.705	82	27.8	149.8	10.522
				84	28.9	154.7	10.877
30	- 1.1	55.23	3.883	86	30.0	159.8	11.236
32		57.83	4.066	88	31.1	164.9	11.594
34	1.1	60.51	4.254				
36	2.2	63.27	4.448	90	32.2	170.1	11.960
38	3.3	66.11	4.648	92	33.3	175.4	12.332
				94	34.5	180.9	12.719
40	4.4	69.02	4.853	96	35.6	186.5	13.113
42	5.5	71.99	5.062	98	36.7	192.1	13.506
44	6.6	75.04	5.276				
46	7.7	78 18	5.497	100	37.8	197.9	13.914
48	8.8	81.40	5.723	102	38.9	203.8	14.329
				104	40.0	209.9	14.758
50	10.0	84.70	5.955	106	41.1	216.0	15.187
52	11.1	88.10	6.257	108	42.2	222.3	15.630
54	12.2	91.5	6.433				
56	13.3	95.1	6.686	110	43.3	228.7	16.080
58	14.5	98.8	6.947	112	44.4	235.2	16.537
				114	45.6	241.9	17.008
60	15.6	102.5	7.206	116	46.7	248.7	17.486
62	16.7	106.3	7.474	118	47.8	255.6	17.971
64	17.8	110.2	7.748				

Table 5-2. NORMAL OPERATING PRESSURES (In Full Cooling DECREASE Mode.)

Temperatures	Pressure Range (psig)			
Outdoor Ambient	50°F (10°C)	75°F (24°C)	100°F (38°C)	120°F (49°C)
90°F (32°C) Return Air to Unit (Dry Bulb)	52-62 Suction 175-195 Discharge	57-67 Suction 235-255 Discharge	66-76 Suction 300-320 Discharge	74-84 Suction 370-390 Discharge
80°F (27°C) Return Air to Unit (Dry Bulb)	47-57 Suction 165-185 Discharge	53-63 Suction 215-235 Discharge	60-70 Suction 290-310 Discharge	70-80 Suction 360-380 Discharge
70°F (21°C) Return Air to Unit (Dry Bulb)	45-55 Suction 140-160 Discharge	45-55 Suction 205-225 Discharge	49-59 Suction 285-305 Discharge	57-67 Suction 365-385 Discharge

NOTE: Wet bulb temperatures uncontrolled (dry coil)
Pressure ranges are ± 5 (Suction) & ± 10 (Discharge) psig about the tested nominal.

Table 5-3. NORMAL OPERATING PRESSURES (In By-Psss Cycle.)

Temperatures	Pressure Range (psig)			
Outdoor Ambient	50°F (10°C)	75°F (24°C)	100°F (38°C)	120°F (49°C)
90°F (32°C) Air to Unit	47-57 Suction 105-125 Discharge	47-57 Suction 147-167 Discharge	47-57 Suction 208-228 Discharge	47-57 Suction 284-304 Discharge
80°F (27°C) Air to Unit	47-57 Suction 105-125 Discharge	47-57 Suction 146-166 Discharge	47-57 Suction 208-228 Discharge	47-57 Suction 284-304 Discharge
70°F (21°C) Air to Unit	47-57 Suction 105-125 Discharge	47-57 Suction 142-162 Discharge	47-57 Suction 205-225 Discharge	47-57 Suction 280-300 Discharge

5-13. DESICCANT REFRIGERANT DEHYDRATOR (FILTER DRIER)

Preliminary procedure: Remove junction box. (See para 4-46.)

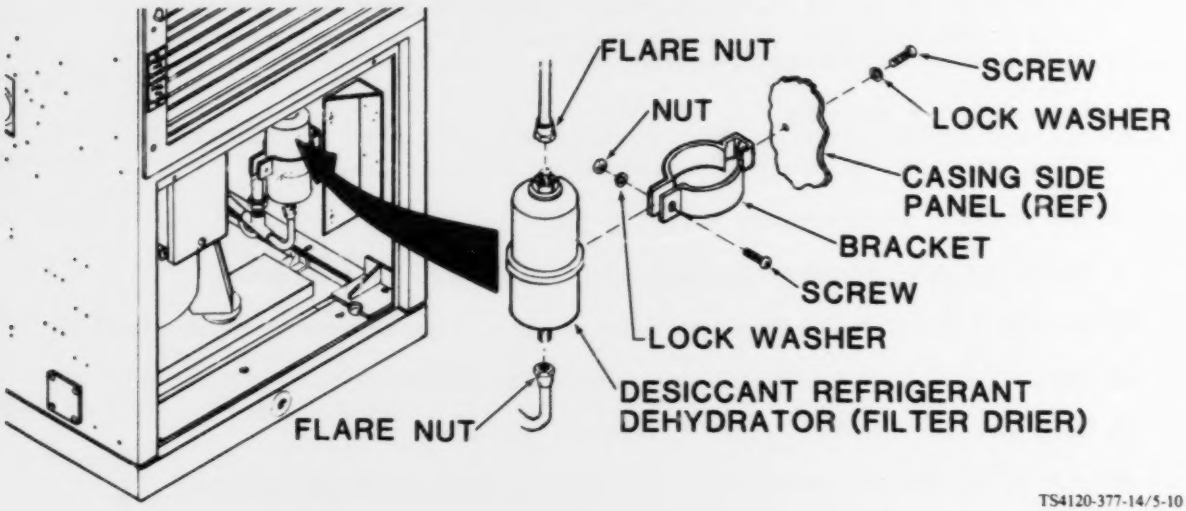


Figure 5-10. Desiccant Refrigerant Dehydrator (Filter Drier)

NOTE

The dehydrator must be replaced each time the refrigeration system has been opened. It should be installed just before unit is leak tested.

a. Inspect

(1) Check for general condition and signs of leakage. If leakage is suspected, leak test per paragraph 5-9.

(2) Check that mounting bracket is secure.

b. Remove

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Using wrench, loosen and disconnect flare nuts.

(3) Using screwdriver, remove bracket mounting screw and lock washer from right side of air conditioner.

(4) Slip dehydrator and bracket from air conditioner.

(5) Using screwdriver and wrench, remove screw, lock washer, and nut from bracket.

(6) Remove dehydrator from bracket.

c. Installation

CAUTION

Replacement dehydrators are packaged with sealing caps on the flare fittings to prevent moisture contamination of the desiccant filtering media. Remove these caps immediately prior to installation. Never install a dehydrator from which caps have been removed for an extended or unknown period of time.

(1) Place dehydrator in bracket.

(2) Loosely assemble bracket with screw, lock washer, and nut on dehydrator.

(3) Slip dehydrator and bracket into place.

(4) Be sure that flow arrow is pointing up.

(5) Using wrench, tighten both flare nuts.

(6) Using screwdriver, install bracket with screw and lock washer.

(7) Using screwdriver and wrench, tighten bracket on dehydrator.

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedure: Install junction box. (See para 4-46.)

5-14. LOW PRESSURE CUT-OUT SWITCH (S7)

Preliminary procedure: Remove rear panel. (See para 4-32.)

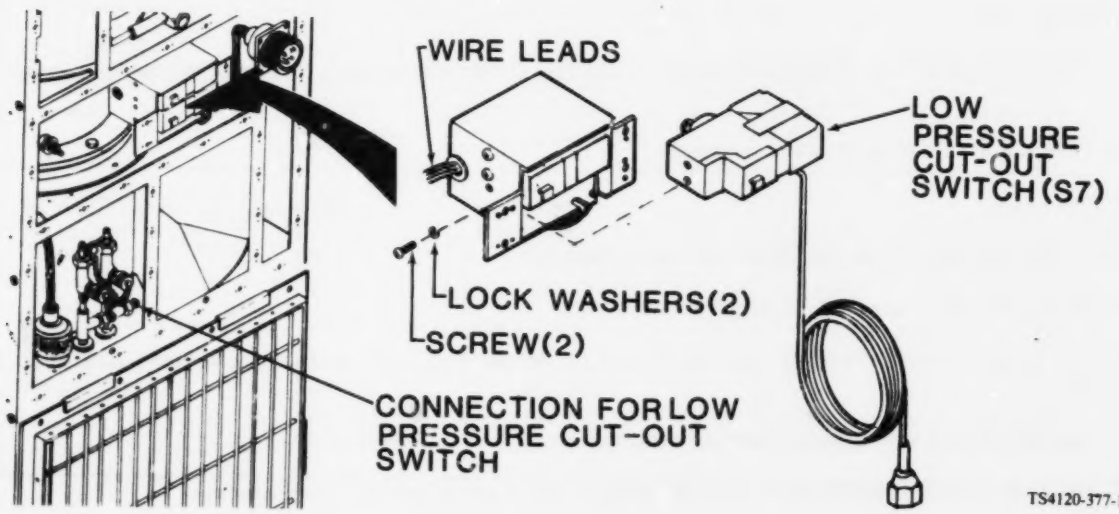


Figure 5-11. Low Pressure Cut-Out Switch (S7)

a. Inspection/Test

(1) Check to see that power has been disconnected.

(2) Using screwdriver, remove two screws and lock washers from switch.

(3) Carefully pull switch from box far enough to gain access to terminals. Remove protective clip-on cap.

(4) Check that wire leads and terminal attachment screws are in place and secure. Tighten if loose. Replace if missing.

(5) Check that capillary line is not kinked, mashed, or broken. Replace switch if capillary line is damaged.

NOTE

Check that refrigerant system is properly charged. (See para 5-12.)

(6) Press and release the reset button to be sure switch is not tripped.

(7) Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

b. Removal

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Using screwdriver, remove two screws and lock washers from pressure switch.

(3) Using wrench, loosen and disconnect pressure switch capillary tubing flare nut from low pressure (suction) service valve line.

(4) Carefully pull switch from box far enough to gain access to terminals. Remove protective clip-on cap.

(5) Tag and disconnect wire leads from pressure switch.

(6) Remove pressure switch and capillary with flare nut from unit.

c. Installation

(1) Insert capillary with flare nut through hole in back of casing bulkhead.

(2) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(3) Remove tags and install protective clip-on cap.

(4) Using screwdriver, secure pressure switch to box with two screws and lock washers.

(5) Using wrench, connect flare nut to low pressure (suction) service valve line.

(6) Carefully coil excess capillary tubing and tape in place to eliminate vibration.

(7) Replace the dehydrator. (See para 5-13.)

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedure: 1. Install rear panel. (See para 4-32.)

2. Press and release pressure switch reset buttons to be sure they are not tripped.

5-15. HIGH PRESSURE CUT-OUT SWITCH (S6)

Preliminary procedure: Remove rear panel. (See para 4-32.)

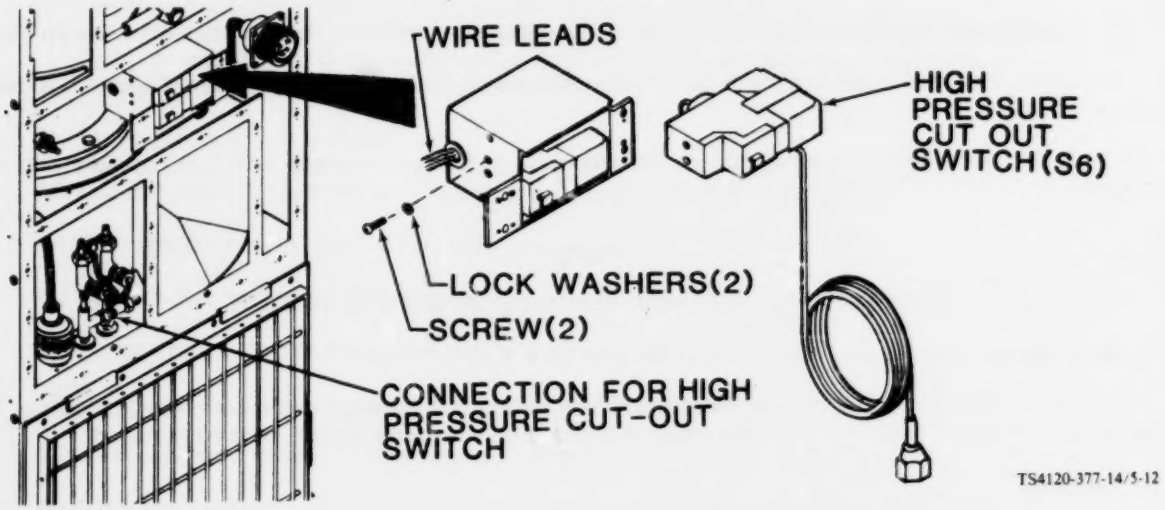


Figure 5-12. High Pressure Cut-Out Switch (S6)

a. Inspection/Test

(1) Check to see that power has been disconnected.

(2) Using screwdriver, remove two screws and lock washers from switch.

(3) Carefully pull switch from box far enough to gain access to terminals. Remove protective clip-on cover.

(4) Check that wire leads and terminal attachment screws are in place and secure. Tighten if loose. Replace if missing.

(5) Check that capillary line is not kinked, mashed, or broken. Replace switch if capillary line is damaged.

NOTE

Check that refrigerant system is properly charged. (See para 5-12.)

(6) Press and release the reset button to be sure switch is not tripped.

(7) Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

b. Removal

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Using screwdriver, remove two screws and lock washers from pressure switch.

(3) Using wrench, loosen and disconnect pressure switch capillary tubing flare nut from high pressure (discharge) service valve line.

(4) Carefully pull switch from box far enough to gain access to terminals. Remove protective clip-on cap.

(5) Tag and disconnect wire leads from pressure switch.

(6) Remove pressure switch and capillary with flare nut from unit.

c. Installation

(1) Insert capillary with flare nut through hole in back of casing bulkhead.

(2) See tags and wiring diagram (fig. 4-20) and connect wire leads.

(3) Remove tags and install protective clip-on cap.

(4) Using screwdriver, secure pressure switch to box with two screws and lock washers.

(5) Using wrench, connect flare nut to high pressure (discharge) service valve line.

(6) Carefully coil excess capillary tubing and tape in place to eliminate vibration.

(7) Replace the dehydrator. (See para 5-13.)

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedures: 1. Install rear panel. (See para 4-32.)

2. Press and release pressure switch reset buttons to be sure they are not tripped.

5-16. SERVICE VALVES

Preliminary procedure: Remove rear panel. (See para 4-32.)

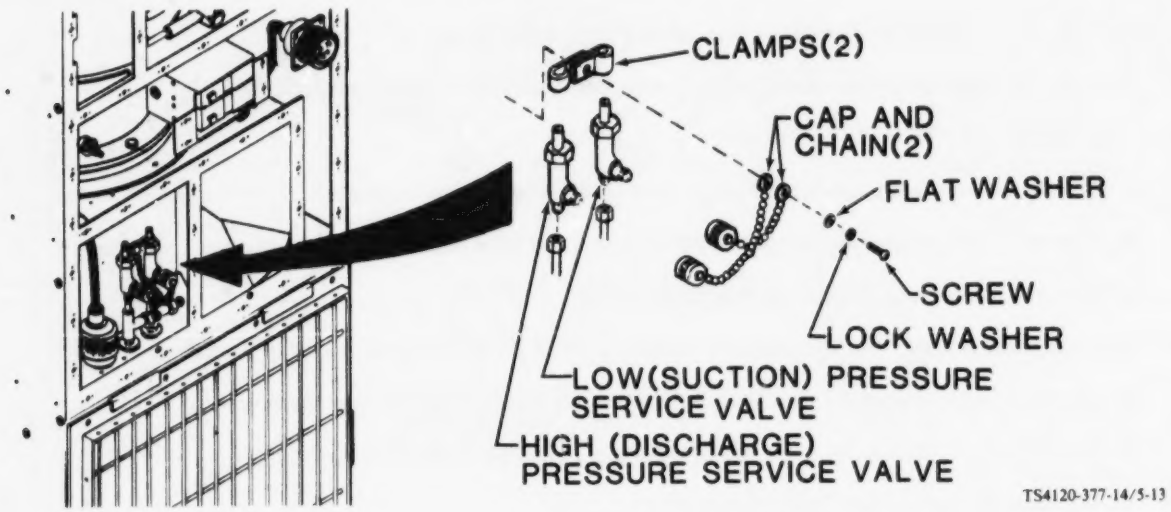


Figure 5-13. Service Valves

a. Inspect

(1) Check that caps are in place and that threaded connection ends are not damaged. Replace if missing or damaged.

(2) Check for signs of leakage. Leak test per para 5-9, if leak is suspected.

b. Removal

(1) Using screwdriver, remove screw, lock washer, flat washer, and clamp.

(2) Discharge the refrigerant system. (See para 5-6.)

(3) Observe position of valve for proper installation.

(4) Using two wrenches, restrain valve body and loosen and disconnect flare nut.

(5) Remove the valve.

c. Installation

(1) Position valve in unit as noted during disassembly.

(2) Using two wrenches, restrain valve body and tighten flare nut.

(3) Using screwdriver, secure valve and cap and chain with screw, flat washer, lock washer, and clamp.

(4) Replace the dehydrator. (See para 5-13.)

(5) Leak test the newly connected joints and all connections in those areas. (See para 5-9.)

(6) Evacuate and charge the system. (See para 5-10 and 5-11.)

(7) Check that valve stem and hose connection protective caps are in place on valves.

Follow-on procedure: Install rear panel. (See para 4-32.)

5-17. SOLENOID VALVES (L1 and L2) TEST AND COIL REPLACEMENT

Preliminary procedure: Remove junction box. (See para 4-46.)

a. Test

(1) Check to be sure power has been disconnected.

NOTE

The following basic instructions apply to both the equalizing solenoid L2 and the liquid line solenoid L1.

(2) Disconnect wiring harness connector (P6) from connector (J6) on solenoid valve (L2) or connector (P5) from connector (J5) on solenoid valve (L1).

(3) Use a multimeter set on lowest OHMS scale to check for continuity between contacts A and B in solenoid valve connector. If continuity is not found, coil is open and must be replaced.

(4) Use multimeter to check for continuity between each contact in solenoid valve connector and coil casing. If continuity is found between either contact and case, the coil is grounded and should be replaced.

(5) If continuity checks are satisfactory, apply 24 volts dc from an external power supply across contacts A and B in solenoid valve connector, and listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and entire valve should be replaced. (Go to para 5-18.)

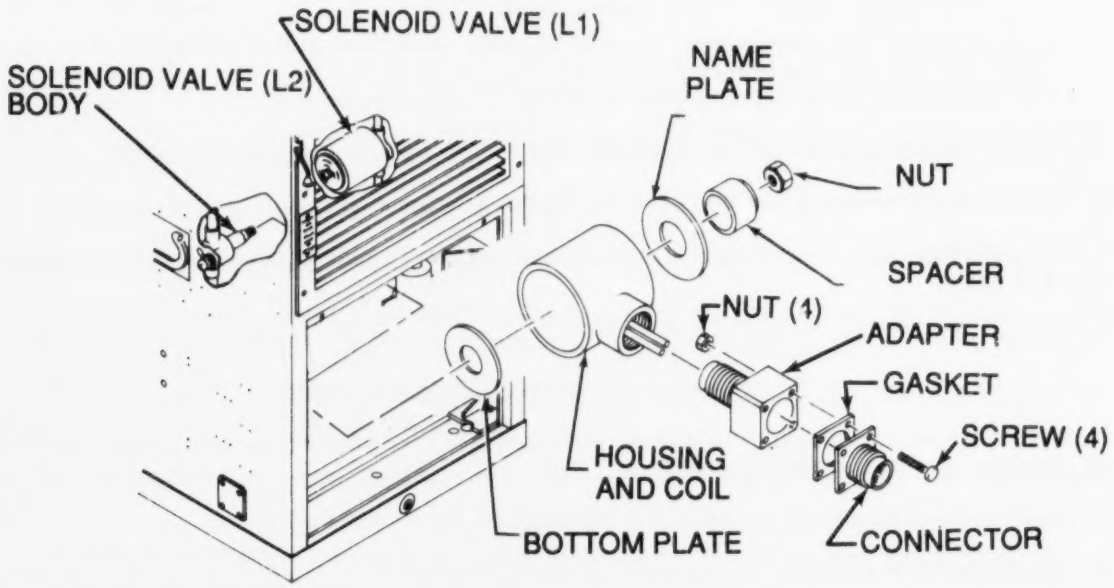


Figure 5-14. Solenoid Valve Coil Replacement (Applied Model 3788)

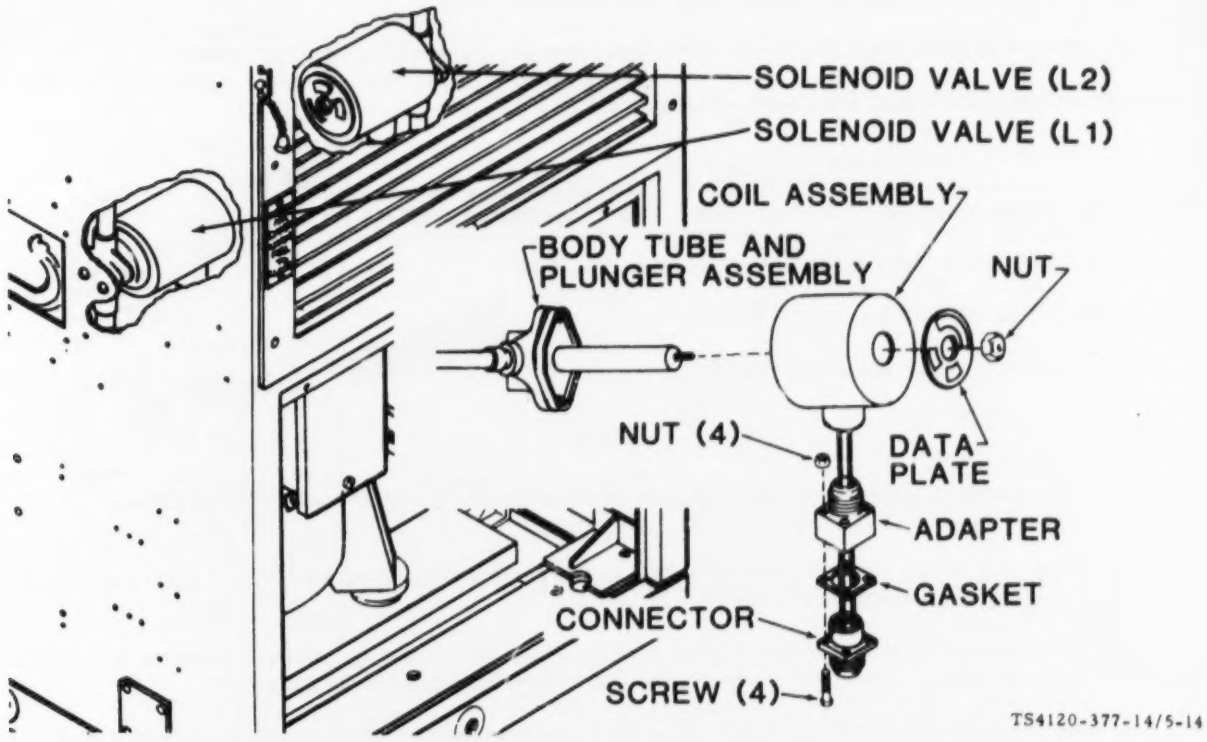


Figure 5-14.1. Solenoid Valve Coil Replacement (Keco Model F-18T4-2S)

b. Coil replacement. The coil can be replaced without opening the refrigeration pressure system.

WARNING

Do not attempt any disassembly of solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if screws that attach tube and plunger assembly to valve body are loosened.

(1) Remove nut that attaches coil to valve body, and remove coil and connector assembly.

(2) Remove four screws and nuts that attach connector to adapter on coil.

(3) Pull connector away from adapter, unsolder coil leads from pins in the connector, and remove connector and gasket.

(4) Remove adapter from the coil casing.

(5) Feed leads of new coil through adapter, and install adapter on coil casing.

(6) Feed coil leads through gasket and solder them to pins in connector. Then install gasket, connector, and four attaching screws and nuts on adapter.

(7) Install coil and connector assembly, and the attaching nut on valve body.

(8) Connect harness connector to connector on solenoid valve.

Follow-on procedure: Install junction box. (See para 4-46.)

5-18. SOLENOID VALVES (L1 AND I2) (FOR KECO MODEL F18T4-2S ONLY)

For testing and replacement of coils, see paragraph 5-17.

Preliminary procedure: Remove junction box. (See para 4-46.)

a. Removal

(1) Check to be sure power has been disconnected.

(2) Discharge the refrigeration system in accordance with paragraph 5-6.

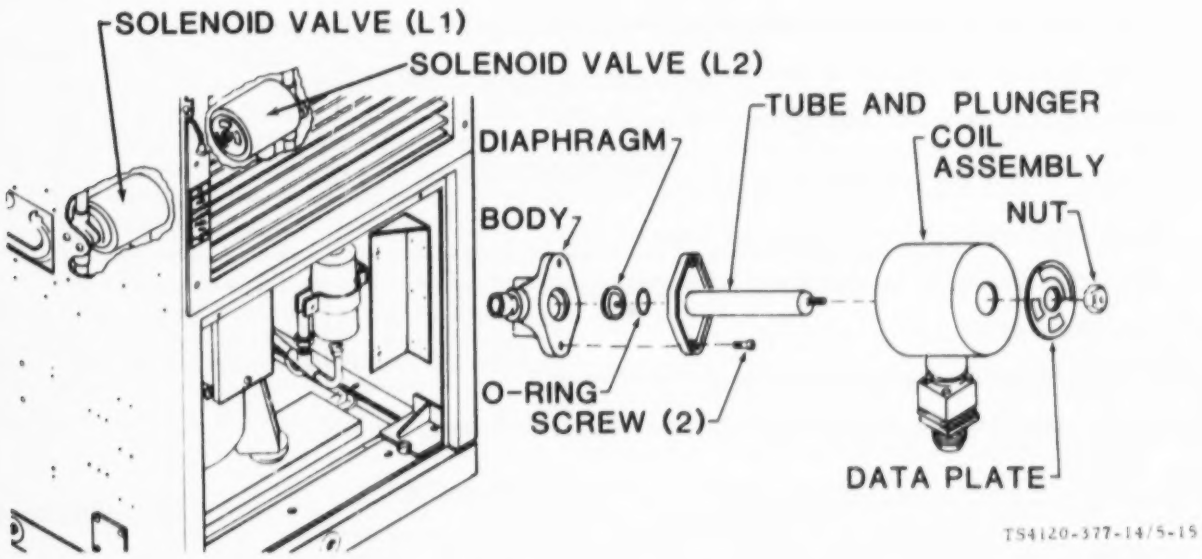


Figure 5-15. Solenoid Valves (L1 and L2) (KECO Model F18T4-2S)

(3) Disconnect wiring harness connector (P6) from (J6) on solenoid valve (L2) or connector (P5) from connector (J5) on solenoid valve (L1).

(4) Remove nut that attaches coil to valve body.

(5) Remove coil assembly and data plate.

(6) Remove two screws that attach tube and plunger assembly to valve body. Remove tube and plunger assembly, and all other removable internal components from valve body.

(7) Check valve body for visible damage. Normally valve body replacement is unnecessary. If valve body is in good condition, skip steps (8) through (10).

(8) Using screwdriver, remove two screws and lock washers that attach base of valve body to casing side panel.

(9) Purge the system with nitrogen and debraze the tube connections. (See para 5-7 and 5-8.)

(10) Remove the valve body.

b. Installation. If valve body was not removed, go to step (3).

(1) Place the valve body on the tube ends, purge the system with nitrogen and braze the tube joints. (See para 5-7 and 5-8.)

(2) Using a screwdriver, secure the valve body to the casing side panel with two screws and lock washers.

(3) Check internal surfaces of valve body to be sure it is clean.

(4) Carefully install diaphragm, O-ring, and tube and plunger. Secure to valve body with two screws.

(5) Place coil assembly and data plate onto tube and plunger and secure with nut.

(6) Reconnect connector and harness.

(7) Replace the dehydrator. (See para 5-13.)

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedure: Install junction box. (See para 4-46.)

5-18.1 SOLENOID VALVES (L1 and L2) (FOR APPLIED MODEL 3788 ONLY)

For testing and replacement of coils, see paragraph 5-17.

Preliminary procedure: Remove junction box. (See para 4-46.)

a. Removal

(1) Check to be sure power has been disconnected.

(2) Discharge the refrigeration system in accordance with paragraph 5-6.

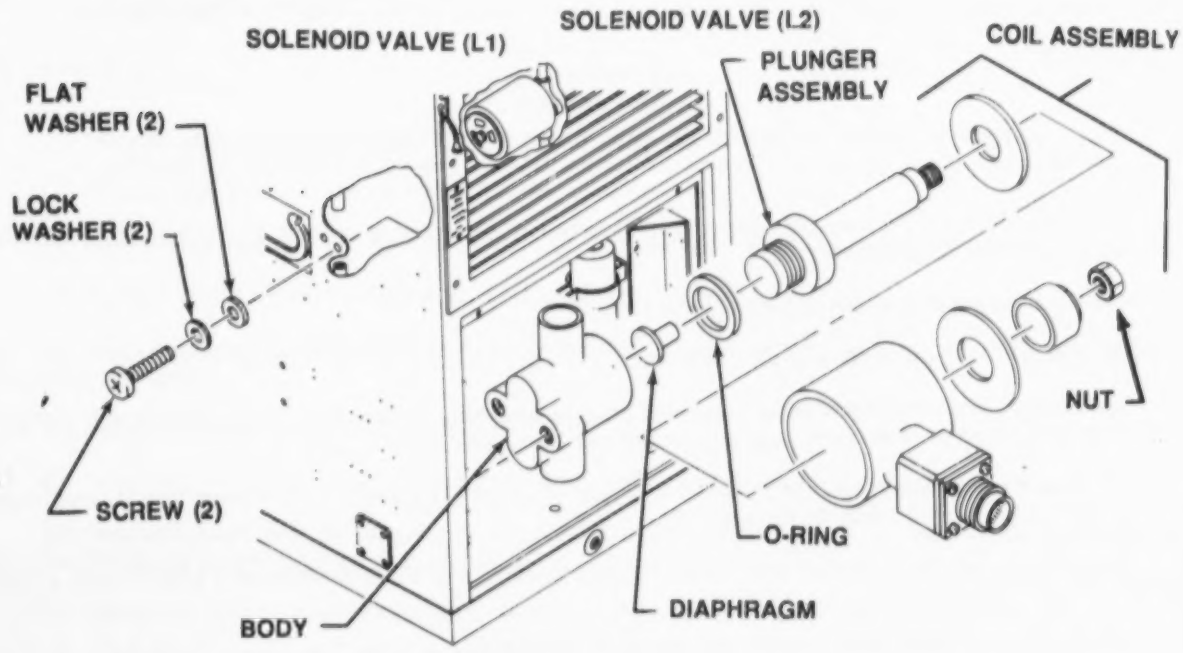


Figure 5-15.1 Solenoid Valves (L1 and L2) (Applied Model 3788)

(3) Disconnect wiring harness connector (P6) from (J6) on solenoid valve (L2) or connector (P5) from connector (J5) on solenoid valve (L1).

(4) Remove coil and component parts. (See para 5-17.)

(5) Using wrench, remove plunger assembly from valve body. Remove O-ring, diaphragm and washer from valve body.

(6) Check valve body for visible damage. Normally valve body replacement is unnecessary. If valve body is in good condition, skip steps (7) through (9).

(7) Using screwdriver, remove two screws and lock washers that attach base of valve body to casing side panel.

(8) Purge the system with nitrogen and debraze the tube connections. (See para 5-7 and 5-8.)

(9) Remove the valve body.

b. Installation. If valve body was not removed, go to step (3).

(1) Place the valve body on the tube ends, purge the system with nitrogen and braze the tube joints. (See para 5-7 and 5-8.)

(2) Using screwdriver, secure the valve body to the casing side panel with two screws and lock washers.

(3) Check internal surface of valve body to be sure it is clean.

(4) Carefully install washer, diaphragm assembly and O-ring in valve body.

(5) Using wrench, install plunger assembly in valve body.

(6) Install coil and component parts. (See para 5-17.)

(7) Reconnect connector and harness.

(8) Replace dehydrator. (See para 5-13.)

(9) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(10) Evacuate and charge the system. (See para 5-10 and 5-11.)

Follow on procedure: Install junction box. (See para 4-46.)

5-19. LIQUID QUENCH EXPANSION VALVE

Preliminary procedure: Remove the junction box. (See para 4-46.)

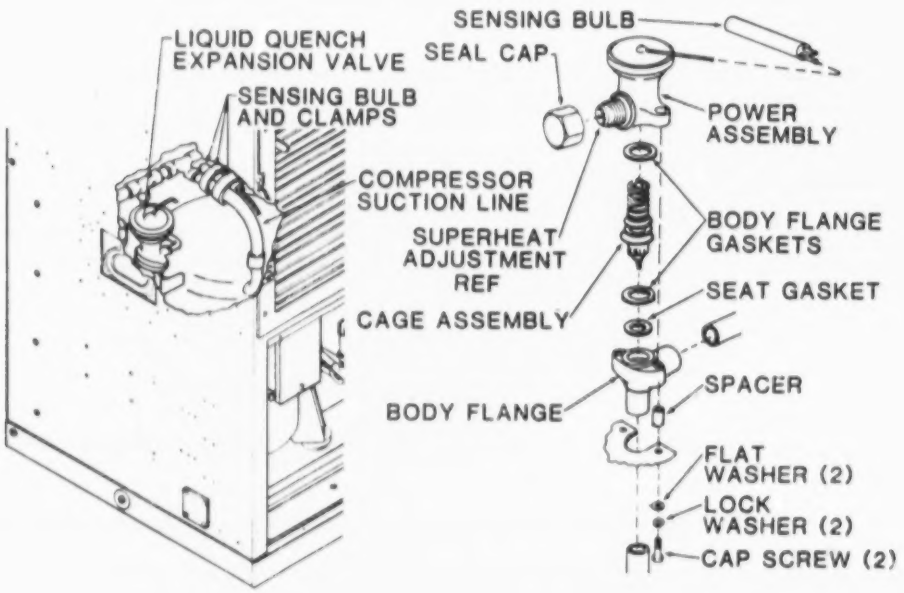


Figure 5-16. Liquid Quench Expansion Valve

a. Inspection

(1) Inspect for evidence of leaks, kinked, or otherwise damaged capillary line, and loose or missing mounting hardware.

(2) Check thermal bulb to see that is is securely clamped to the suction line.

(3) If a leak is suspected or indicated, test per paragraph 5-9.

b. Test

(1) Perform a refrigerant pressure check on unit in accordance with paragraph 5-12. Leave gages or service manifold attached.

(2) Unwrap insulation tubing from compressor suction line so that sensing bulb and an adjacent section of the suction line is exposed.

(3) Attach an accurate thermometer to an exposed surface to suction line adjacent to the sensing bulb: use a small gob of thermal mastic, to improve conductivity.

(4) Check that service valve and gage connection to low (suction) side are open. Note pressure indicated on gage and temperature indicated on thermometer.

(5) Set the TEMPerature control thermostat knob to full INCREASE (clockwise). Start the air conditioner in COOL mode. Note that suction pressure drops to 58 ± 2 psig (4.0 ± 0.2 kg/cm^2). Allow compressor to run for at least 20 minutes. If pressure is not within above limits, test operation of pressure regulating valve (para 5-24) before proceeding with quench valve test.

NOTE

Except in a very hot climate, with room air temperature above 90 F (32.2 C), the refrigeration system will be in a bypass cycle with a maximum volume of hot discharge vapor being recirculated back to suction side of compressor through pressure regulator valve and quench valve.

(6) Observe that temperature indicated remains stable for a minimum of two minutes, then find saturation temperature for pressure indicated on gage, using table 5-1. For example: The saturation temperature for a refrigerant pressure of 69 psig (4.85 kg/cm^2) is 40 F (4.4 C).

(7) Compare the saturation temperature with indicated temperature. The indicated temperature should be 25 ± 5 F (13.9 ± 2.2 C) higher than the saturation temperature. For example: With a 40 saturation temperature, the thermometer should read 65 ± 5 F. If indicated temperature is not within above limits, quench valve is not functioning properly and should be adjusted:

NOTE

If valve does not need adjustment, skip (8) below.

(8) If the superheat setting is not within the limits shown above, adjust the liquid quench expansion valve as follows:

(a) Remove the hexagonal seal cap from the side of the power assembly.

(b) Turn the adjusting stem two complete turns to change the superheat setting by 1 F (0.55 C). Turn the stem clockwise to increase superheat span; counterclockwise to decrease it. Do not change more than two full turns at one time, then wait at least 2 minutes for temperature to stabilize and recheck pressure and temperature before further adjustment. If valve cannot be properly adjusted, replace the valve.

(c) When the proper setting is obtained, install the seal cap.

(9) Turn unit OFF.

(10) Remove thermometer.

(11) Cover the sensing bulb and suction line with insultation tubing that was removed in step (2) above. Secure tubing in place using tape, item 11, Appendix E.

(12) Close service valves on unit.

(13) Remove gages or service manifold from service valves.

(14) Install hose connection protective caps.

(15) Using screwdriver, secure service valve cover with four screws and flat washers.

c. Removal

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Unwrap insulation tubing from suction line so that sensing bulb is exposed. Note location and position of bulb for reinstallation. Loosen screws and nuts in clamps. Pull bulb out of clamps.

(3) Using wrench, remove two cap screws, lock washers, flat washers, and spacers that attach valve body to bracket and power assembly.

(4) Carefully remove the power assembly, cage assembly, and gaskets.

NOTE

If valve body flange is not damaged, do not remove (debraze) it from the system.

(5) If valve body flange is to be removed, purge the system with nitrogen and debraze the two tubes. (See para 5-7 and 5-8.)

d. Installation

(1) If valve body flange was removed, purge the system with nitrogen and braze the two tubing joints. (See para 5-7 and 5-8.)

(2) See figure 5-16 for valve component arrangement.

(3) Place cap screws, lock washers, flat washers, and spacers through bracket and valve body flange.

(4) Be sure that valve components are properly assembled and alined. Secure power assembly to body flange.

(5) Insert sensing bulb into its mounting loop clamps in its original position, and tighten the screws and nuts. Be sure sensing bulb is installed in the original position and is making good metal-to-metal contact with suction line.

(6) Reinstall insulation tubing that was removed from sensing bulb and liquid quench expansion valve connections. Secure insulation tubing with tape, item 11, Appendix E.

(7) Replace the dehydrator. (See para 5-13.)

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedure: Install junction box. (See para 4-46.)

5-20. COMPRESSOR (B1)

Preliminary procedures: 1. Remove junction box. (See para 4-46.)
2. Remove side access plate. (See para 4-22.)

The compressor and motor assembly are hermetically sealed in a metal canister and are not repairable. The following items may be replaced without opening the refrigerant pressure system:

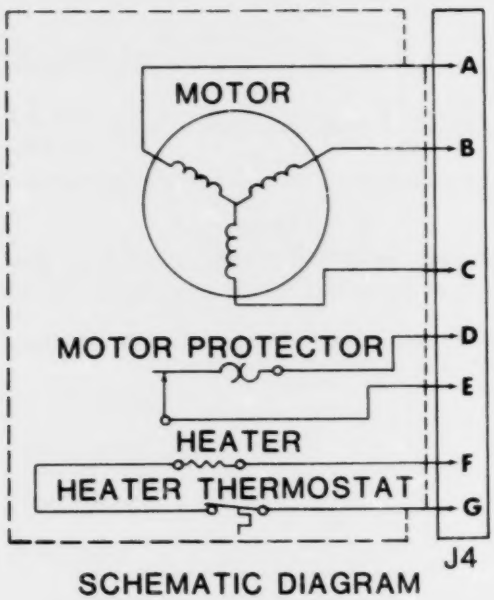
- Connector (J4)
- Heater
- Heater thermostat

a. Inspection/Test

(1) Be sure power has been *disconnected* from air conditioner.

(2) Electrically test the heater element, heater thermostat, wiring harness, and motor as follows.

(3) Disconnect wiring harness at connectors P4 and J4 (located on the compressor junction box).



TS4120 377-14/5-17

Figure 5-17. Compressor Schematic

WARNING

Do not touch heating element.

(4) *Carefully* feel *lower part* of compressor.

- If air conditioner has been connected to power supply for at least four hours, compressor should feel *warm* (100 to 120°F). If not warm, test crankcase heater for continuity.
- If air conditioner has not been connected to power supply for at least four hours, compressor temperature should be the same as surrounding air temperature.

(5) Using multimeter, test crankcase heater and thermostat circuit at J4 connector:

- Using multimeter, test resistance from pin F to pin G. Resistance should be 950 to 1430 ohms. Lower reading indicates short, and infinite reading indicates an open.

(6) Using multimeter, test crankcase heater and thermostat at junction box:

- Remove compressor junction box cover.
- Open connection between thermostat lead and heater lead.
- Check heater continuity between open connection and J4-F. If open, heater should be replaced.
- Check thermostat continuity between open connection and J4-G. If open, thermostat should be replaced.

(7) Using multimeter, test compressor motor windings.

- Check continuity between pins A, B, and C and the compressor body. No continuity should exist. If continuity exists, the compressor is bad.
- Test 3 phase windings at J4:
  A to B
  B to C
  A to C
  All resistances should be above zero and less than 2 ohms.
- Test resistance between pin D and pin E. Resistance should be *zero* indicating motor protector is closed.
- Compressor containing shorted, open or grounded winding or open motor protector, should be replaced.
- If compressor windings are bad, check for compressor burn out prior to installing a new compressor. (See instructions in compressor removal.)

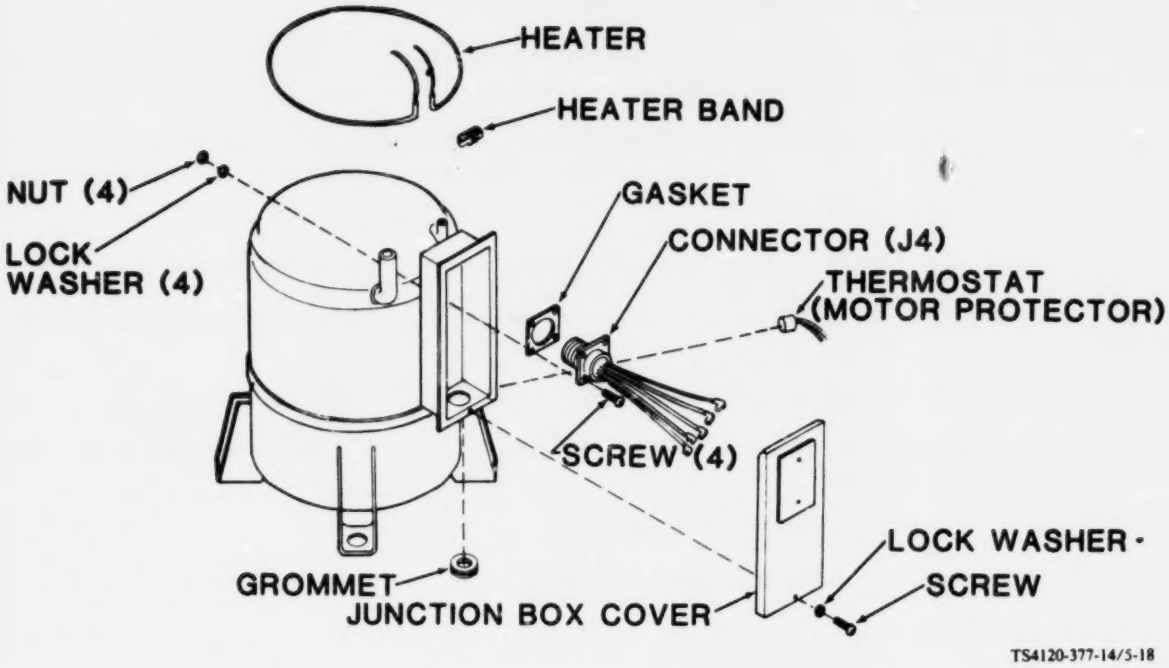


Figure 5-18. Compressor Replaceable Items

b. Heater replacement. (Refrigerant system discharge is not required.)

(1) Check to see that the power has been disconnected at the power source and covers have been removed during access and testing.

WARNING

Allow heater to cool before touching. Severe burns can result from touching hot heater.

(2) Tag and disconnect two heater leads from junction box terminals.

(3) Using pliers, remove band on heater.

(4) Spread the heater ends to clear junction box.

(5) Lift heater up and off compressor crankcase.

(6) Install new heater as follows.

(7) Spring heater ends apart and place heater down and around compressor in position on crankcase. Using pliers, secure heater on crankcase with metal band.

(8) Run leads through the grommet in the compressor junction box.

(9) See tags on the removed heater. Connect heater leads to J4 pins F and G.

(10) If this completes the repair, install junction box cover.

c. Connector replacement. (Refrigerant system discharge is not required.)

(1) Assuming that the power has been disconnected at the power source, and covers have been removed during access and testing, proceed as follows.

(2) Remove the retaining hardware from the connector. Pull the connector out of the box to gain access to the solder connections.

(3) Tag and unsolder wires.

(4) Using tags and wiring schematic (fig. 5-17), solder wires to new connector. Remove the tags.

(5) Secure the connector to the compressor junction box with four screws, lock washers, nuts and a gasket.

d. Heater thermostat replacement. (Refrigerant system discharge is not required.)

(1) Check to see that the power has been disconnected at the power source and covers have been removed during access and testing.

(2) Tag and disconnect two thermostat leads.

(3) Using pliers, bend retaining tabs back.

(4) Remove thermostat.

(5) Install new thermostat as follows:

(a) Insert thermostat and carefully bend retaining tabs back to secure thermostat.

(b) See tags on removed thermostat. Correct thermostat leads.

(c) If this completes the repair, install junction box cover.

e. Compressor replacement

(1) Check to see that the power has been disconnected at the power source, connectors (P4 and J4) were disconnected and that covers have been removed during access and test, proceed as follows.

NOTE

The compressor is mounted to the cabinet base by four bolts that are inserted from the underside of the base. In order to remove the compressor, it is necessary that the entire air conditioner be raised and placed on blocks of sufficient height to allow for removal of these bolts from below the base.

WARNING

DO NOT LIFT without holding unit in upright position. Otherwise unit will fall over.

(2) Attach an overhead hoist to the lifting handle on each side of the cabinet, using a sling and spreader bar.

(3) Raise the cabinet and place it on blocks at least four inches high. Be sure the blocks do not obstruct the holes in the base through which the compressor mounting shoulder screws must be removed.

(4) Unwrap the insulation from the suction tube so that the joint on the compressor is exposed.

(5) Discharge the refrigerant system per paragraph 5-6.

(6) While purging the system with nitrogen, debraze the tubing. (See para 5-7 and 5-8.)

(7) Using wrenches, remove four lock nuts and flatwashers from top of mounting feet and four shoulder bolts, eight flat washers, and four rubber washers from underneath side of unit.

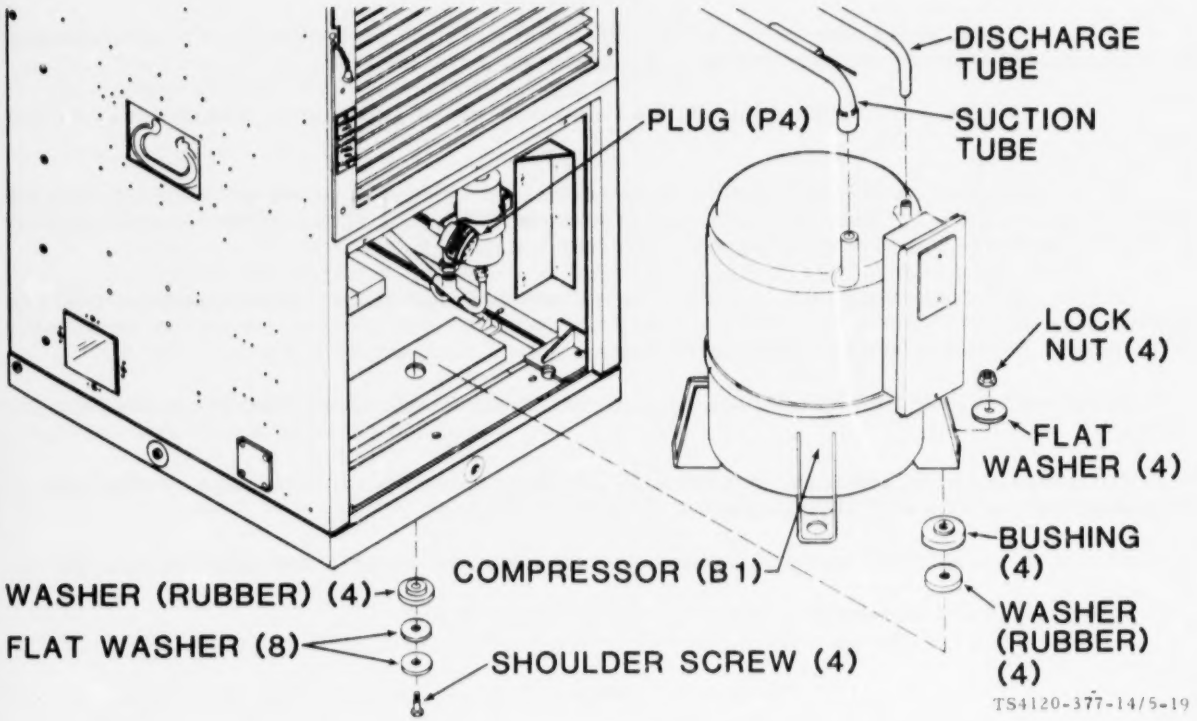


Figure 5-19. Compressor (B1)

(8) Lever or tilt the compressor and remove rubber washer and bushing from under each of the four mounting feet.

WARNING

If compressor burn out is suspected, use care when handling compressor to avoid touching compressor sludge. Acid in sludge can cause burns.

(9) Carefully slide compressor from air conditioner.

(10) Check the compressor to see if a motor burn out is indicated.

f. Compressor motor burn out

(1) After removal of a bad compressor from the refrigeration system, remove all external tubing and tip the compressor toward the discharge port to drain sample of oil into a clear glass container.

WARNING

Avoid inhaling fumes and burns from any acid formed by burn out of oil and refrigerant.

(2) If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burn out. If a burn out is not indicated, proceed to g.

(3) If the oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burn out.

(4) You must clean the entire refrigeration system after a burn out has occurred, since contaminants will have been carried to many corners and restrictions in the piping and fittings. These contaminants will soon mix with new refrigerant gas and compressor oil to cause repeated burn outs.

(5) Remove the dehydrator (filter-drier), and blow down each leg of the refrigeration system. To do this, connect a cylinder of dry nitrogen to each dehydrator connection, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm^2) pressure.

(6) Connect the two dehydrator fittings with a jumper, locally manufactured from refrigerant tubing and fittings.

(7) Clean system by back-flushing with liquid R-11 (item 12, Appendix E) from pressurized cylinder or circulating pump and reservoir with pressure of at least 100 psig.

(8) If pump is used, connect the discharge line of the refrigerant system to the discharge side of pump.

(9) Connect a line containing a filter to the suction line in the unit.

NOTE

An unused dehydrator or other suitable medium may be used as a filter.

(10) The other end of the temporary suction line should be connected to a small drum or suitable reservoir.

(11) A line should be run from the bottom of the reservoir to the inlet of the pump.

WARNING

Avoid inhaling fumes and burns from acid formed by burn out of oil and refrigerant. Wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands.

(12) Fill reservoir with fluorocarbon refrigerant, R-11, and start the pump. Continue filling the reservoir with refrigerant, R-11, until it begins to pour out of the return line. Continue flushing for at least 15 minutes.

(13) Reverse the pump connections, replace the filter with a new filtering medium, and backflush the system for an additional 15 minutes.

(14) Remove the pump, reservoir, filter, and dehydrator jumper. Place an empty container below the compressor connections, and connect a cylinder of dry nitrogen to each filter-drier connection in turn. Blow down each leg of the system at 50 psig (3.5 kg/cm^2) for at least 30 seconds.

(15) Disconnect the dry nitrogen cylinder. Cap or plug open connections if compressor and filter-drier are not to be installed immediately.

g. Compressor installation

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

NOTE

If any refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor before installing it in the air conditioner. Check to see that replacement compressor is equipped with a heater, if not, remove heater from old compressor or replace with new one.

(1) Lift compressor through the lower front panel opening and position it on base pan.

(2) Lever or tilt the compressor and install the rubber washer and bushing between each of the four compressor mounting feet and the base pan.

(3) Install two flat washers and a rubber washer on each of the four mounting shoulder screws, then insert the shoulder screws from beneath the base. Secure with four flat washers and lock nuts on top of mounting feet.

(4) Wrap wet rags around compressor at connection points and while brazing direct flame away from compressor.

(5) While purging the system with nitrogen, braze the tubing joints. (See para 5-7 and 5-8.)

(6) Replace the dehydrator. (See para 5-13.)

(7) Connect electrical connector plug (P4) to connector (J4) on compressor terminal box.

(8) Leak test all newly connected joints and those in the repaired area. (See para 5-9.)

(9) Install junction box. (See para 4-46.)

(10) Install lower front panel. (See para 4-29.)

(11) Install side access plate. (See para 4-22.)

(12) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

5-21. LIQUID SIGHT INDICATOR (SIGHT GLASS)

Preliminary procedure: Remove rear panel. (See para 4-32.)

a. Inspection

(1) Check that glass window is clean and not cracked or broken. Clean if dirty. Replace liquid sight indicator if cracked or broken.

(2) Check for evidence of leakage. Leak test if leak is suspected. Repair or replace as indicated.

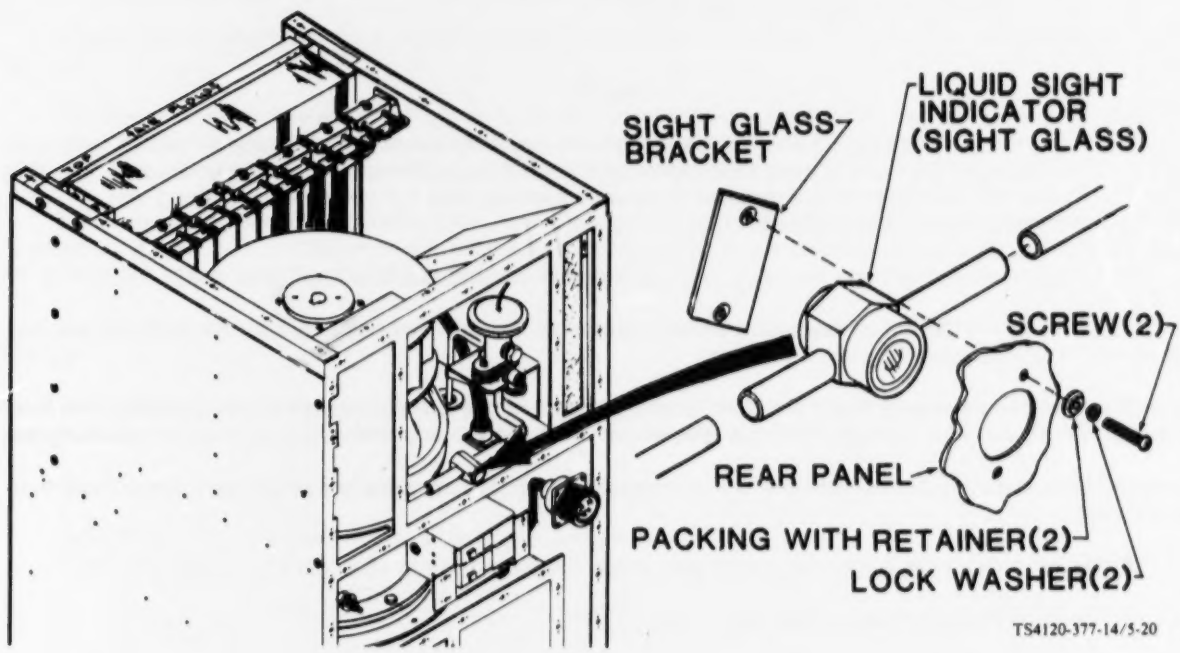


Figure 5-20. Liquid Sight Indicator (Sight Glass)

b. Removal

NOTE

It is necessary to remove sight glass bracket to remove rear panel.

(1) Discharge the refrigerant system per paragraph 5-6.

(2) While purging the system with nitrogen, debraze the tubing. (See para 5-7 and 5-8.)

(3) Remove liquid sight indicator.

c. Installation

NOTE

Do not disassemble liquid sight indicator.

(1) Position liquid sight indicator on tubing.

(2) While purging the system with nitrogen, braze the tubing joints. (See para 5-7 and 5-8.)

(3) Replace the dehydrator. (See para 5-13.)

(4) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(5) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

Follow-on procedure: Install rear panel. (See para 4-32.)

5-22. EXPANSION VALVE

Preliminary procedure: Remove rear panel. (See para 4-32.)

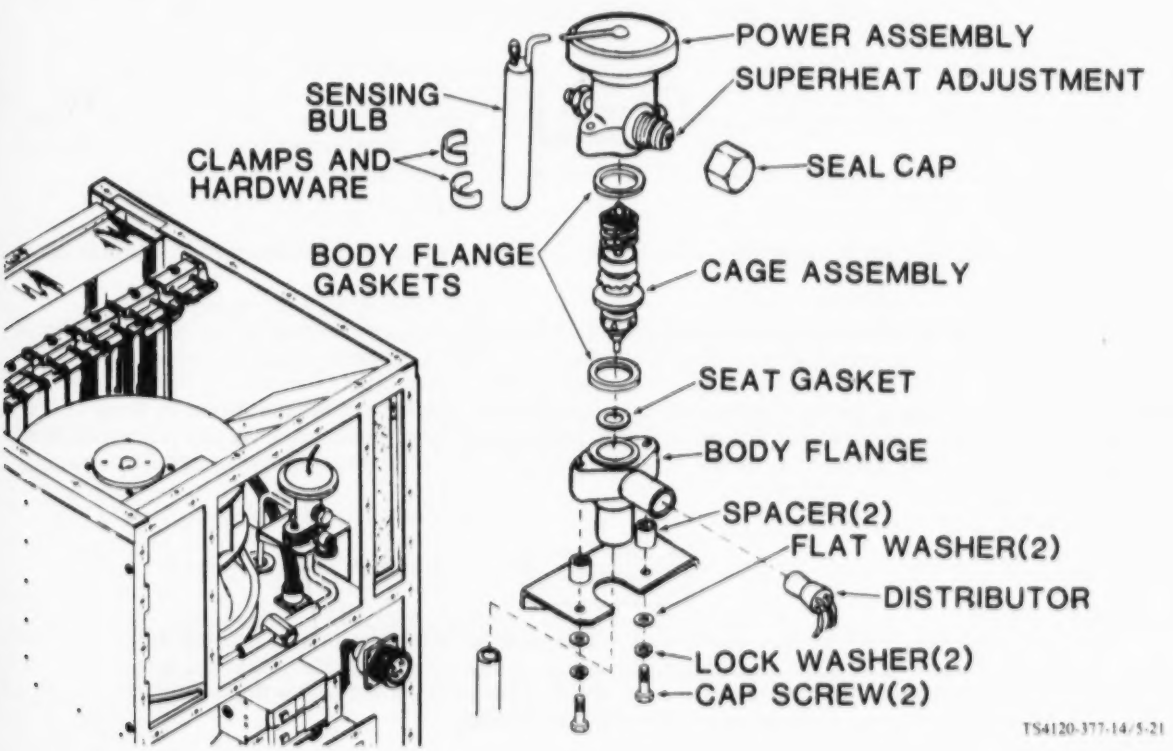


Figure 5-21. Expansion Valve

a. Inspection

(1) Inspect for evidence of leaks, kinked, or otherwise damaged capillary line, and loose or missing mounting hardware.

(2) Check thermal bulb to see that it is securely clamped to the suction line.

(3) If a leak is suspected or indicated, test per paragraph 5-9.

b. Testing and superheat adjustment. The expansion valve as supplied with the unit is preset at the factory. This valve should not be adjusted unnecessarily.

(1) Perform a refrigerant pressure check on unit in accordance with paragraph 5-12. Leave gages or service manifold attached.

(2) Remove the suction line insulation from the area of the sensing bulb. Observe location and position of bulb for reinstallation.

(3) Loosen the screws and nuts in the bulb straps that attach the sensing bulb to the suction line, and pull the bulb out of the straps.

CAUTION

Use care to not damage or kink the capillary.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

(4) Place the sensing bulb in a container of ice water or crushed ice so that it is reduced to a temperature near 32°F (0°C).

(5) Set the TEMPerature control thermostat knob fully DECREASE (counterclockwise), place one hand on the exposed suction return line, and start the air conditioner in COOL mode. If a drop in temperature is felt on the suction return line, the expansion valve is not closing fully and should be replaced. If the return line temperature remains constant, check the pressure gage; it should indicate approximately 58 ± 2 psi (4.0 ± 0.14 kg/cm²). If the pressure is not within the above limits, test the operation of the quench valve (para 5-16) and the pressure regulator valve (para 5-24) before attempting adjustment of the evaporator expansion valve.

CAUTION

When performing the next test, turn the air conditioner to OFF as soon as a definite drop in temperature is felt on the suction return line. If the test conditions are continued more than a few seconds, the expansion valve will fully open and an excessive flood-back of liquid refrigerant may damage or destroy the compressor.

(6) With one hand still on the suction return line, remove the sensing bulb from the container and warm it in the other palm. If a temperature drop is not felt in the suction return line by the time the sensing bulb no longer feels cold to the hand, the expansion valve is not opening and should be replaced. As soon as a temperature drop is felt, turn the air conditioner to OFF.

NOTE

The optimum superheat setting for the evaporator expansion valve is 10°F (5.55°C) above the saturation temperature of the refrigerant at operating suction line pressure. This setting will provide maximum efficiency of the evaporator coil.

(7) Slip the sensing bulb into its mounting loop clamps. Be sure the bulb is installed in its original position and tighten the nuts and screws. Be sure the sensing bulb is making metal-to-metal contact with the suction line.

(8) Attach an accurate thermometer to an exposed surface of the suction return line adjacent to the sensing bulb; use a small gob of thermal mastic to improve conductivity.

(9) Rewrap insulation on the suction return line, being sure to cover the sensing bulb.

(10) Start the air conditioner in the COOL mode with the thermostat set at fully DECREASE (counterclockwise) and allow it to run about 30 minutes, then check to be sure the temperature in the suction line has stabilized and the thermometer reading remains unchanged for at least 2 minutes.

(11) Note the pressure on the gage connected to the low pressure (suction) service valve. Find the saturation temperature for the pressure gage reading (See table 5-1.) and compare with the thermometer reading. The thermometer temperature should be 10 ± 1°F (5.55 ± 0.55°C) higher than the saturation temperature found on the chart.

(12) If the superheat setting is not within the limits shown above, adjust the expansion valve as follows:

(a) Remove the hexagonal seal cap from the side of the power assembly.

(b) Turn the adjusting stem two complete turns to change the superheat setting by 1°F (0.55°C). Turn the stem clockwise to increase superheat span; counterclockwise to decrease it. Do not change more than two full turns at one time, then wait at least 2 minutes for temperature to stabilize and recheck pressure and temperature before further adjustment.

(13) When the proper setting is obtained:

(a) Turn unit OFF.

(b) Replace hexagonal seal cap.

(c) Remove thermometer.

(d) Cover the bulb and suction line with insulation tubing.

Secure insulation tubing with tape, item 11, Appendix E.

(e) Close service valves on unit.

(f) Remove gages or service manifold from service valves.

(g) Install hose connection protective caps.

(h) Using screwdriver, secure service valve cover with four screws and flat washers.

c. Removal

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Unwrap insulation from suction line so that sensing bulb is exposed. Loosen screws and nuts in clamps. Pull bulb out of clamps.

(3) Disconnect flare nut on external equalizer line from expansion valve.

(4) Remove the two screws, flat washers, lock washers, and spacers that attach the valve body to its mounting bracket.

(5) Remove remaining valve components except for body flange. (See figure 5-21.)

NOTE

If valve body flange is not damaged, do not remove (debraze) it from the system.

(6) If valve body flange is to be removed, purge the system with nitrogen and debraze the two tubes. (See para 5-7 and 5-8.)

d. Installation

(1) If valve body flange was removed, purge the system with nitrogen and braze the two tubing joints. (See para 5-7 and 5-8.)

(2) See figure 5-21 for valve component arrangement.

(3) Place cap screws, lock washers, flat washers, and spacers through bracket and valve body flange.

(4) Be sure that valve components are properly assembled and alined and secure power assembly to body flange.

(5) Connect flare nut on external equalizer line to expansion valve.

(6) Insert the sensing bulb into its mounting loop clamps in its original position and tighten the screws and nuts. Be sure the sensing bulb is making good metal-to-metal contact with the suction line.

(7) Replace the insulation tubing that was removed from the sensing bulb and expansion valve connections. Secure with tape, item 11, Appendix E.

(8) Replace the dehydrator. (See para 5-13.)

(9) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(10) Install rear panel. (See para 4-32.)

(11) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

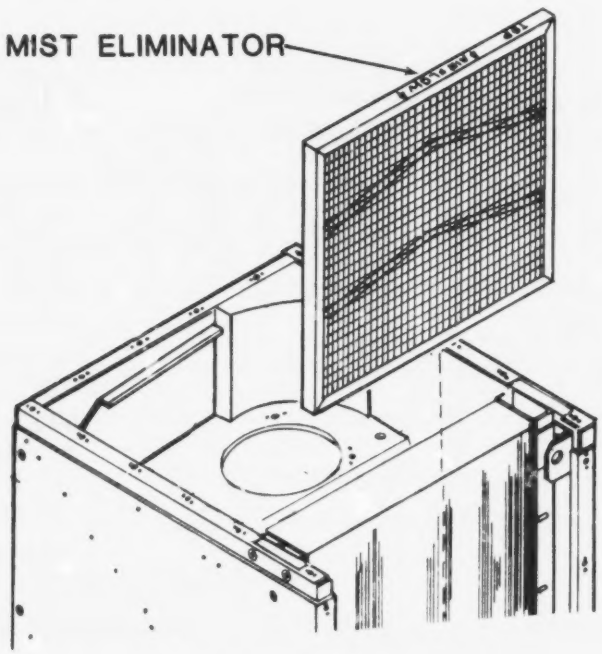
5-23. EVAPORATOR COIL

For inspection and cleaning of installed coil, see para 4-64.

Preliminary procedure: Remove evaporator fan. (See para 4-62.)

a. Removal

(1) Check to see that power has been disconnected.



TS4120-377-14/5-22

Figure 5-22. Mist Eliminator

(2) Lift mist eliminator straight up and out of guides.

(3) Discharge the refrigeration system per paragraph 5-6.

NOTE

Tubes at bottom of evaporator header and elbow at bulkhead are most likely disconnect points. See para 5-22 for disassembly of expansion valve.

(4) While purging the system with nitrogen, debraze the tube joints to the evaporator. (See para 5-7 and 5-8.)

(5) Using screwdriver, remove four screws and remove two side panel inserts.

WARNING

While handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

(6) Using screwdriver, remove eight screws and packing with retainers while supporting the evaporator coil.

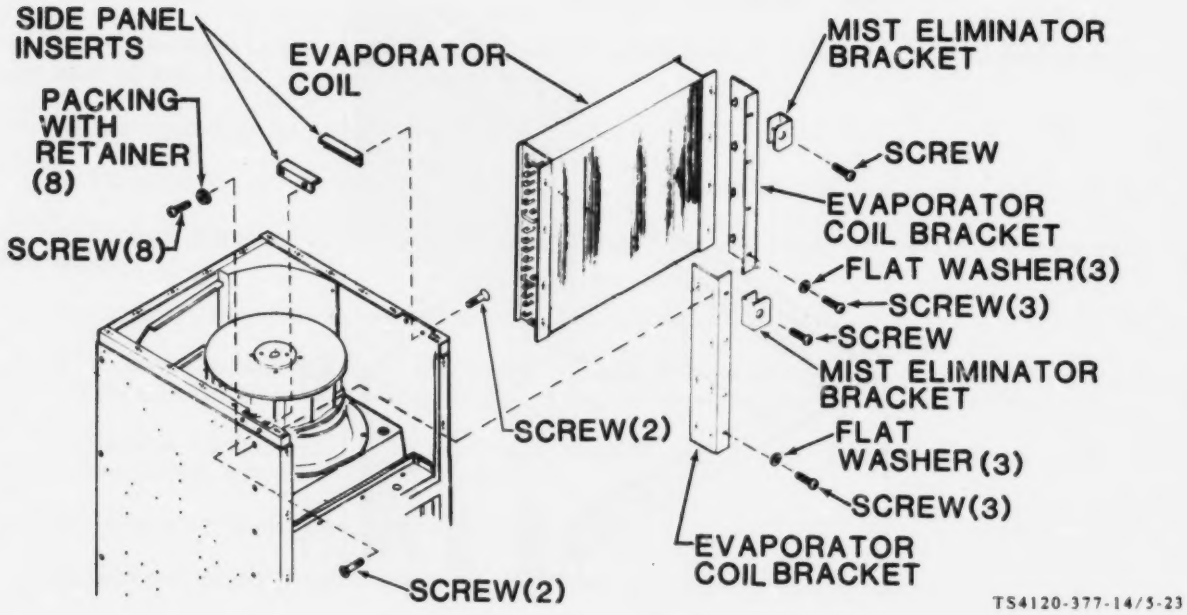


Figure 5-23. Evaporator Coil

(7) Using screwdriver, remove two screws that attach mist eliminator brackets to coil.

(8) Remove mist eliminator brackets.

(9) Using screwdriver, remove three screws and flat washers from each of the evaporator coil brackets.

(10) Slip evaporator coil brackets up and out of unit.

(11) Using screwdriver, remove screw, lock washer, flat washer, and clamp from distributor lines.

(12) Using gloves to protect your hands and coil fins, carefully lift the coil up and out of the unit.

b. Repair

(1) Repairs are limited to replacement of rivets, plate nuts, and straightening of mashed fins.

(2) Plate nuts may be removed by drilling out old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

(4) If fins are mashed or dented so that air flow across coil would be blocked, straightened them using a plastic fin comb.

c. Installation

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

(1) Carefully slide evaporator coil down into unit.

(2) Slide both evaporator coil brackets into place.

(3) Aline and loosely install eight screws and packing with retainers that secure evaporator coil brackets to casing sides.

(4) Aline and loosely install two screws that attach mist eliminator brackets.

(5) Aline and loosely install remaining six screws and flat washers in lower mounting flange holes.

(6) Using screwdriver, tighten all evaporator mounting hardware.

(7) Using screwdriver, secure the two side panel inserts with four screws.

(8) Reassemble expansion valve. (See para 5-22.)

(9) Using screwdriver, secure distributor line clamp with a screw, lock washer, and flat washer.

(10) While purging the system with nitrogen, braze the tube joints. (See para 5-7 and 5-8.)

(11) Replace the dehydrator. (See para 5-13.)

(12) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(13) Slide mist eliminator straight down into guides. Be sure that TOP marking is up and that air flow arrow points out away from evaporator coil and unit.

(14) Install evaporator fan. (See para 4-62.)

(15) Evacuate and charge the refrigeration system. (See para 5-10 and 5-11.)

5-24. PRESSURE REGULATING VALVE

a. Adjustment/Test

(1) Valves are factory set to start opening when suction pressure decreases to 58 psig. Do not adjust unless you are sure adjustment is necessary.

(2) Perform a refrigeration pressure check on unit in accordance with paragraph 5-12. Leave the gages or service manifold attached.

(3) Set TEMPerature control thermostat knob fully INCREASE (clockwise), start air conditioner in COOL mode, and observe pressure gages. Suction pressure should drop to 58 ± 2 psi (4.0 ± 0.14 kg/cm²) shortly after compressor starts, and then remain constant.

(4) If unit fails above test, the pressure regulating valve must be adjusted.

(a) Turn unit OFF.

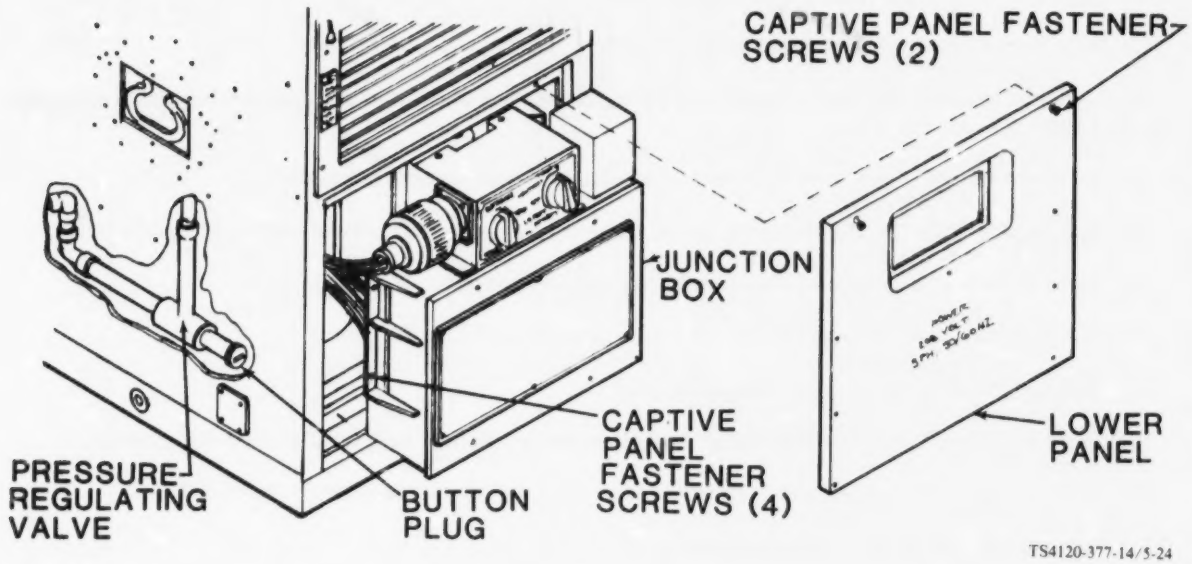


Figure 5-24. Pressure Regulating Valve Access

(b) Using screwdriver, loosen two captive panel fastener screws in lower front panel.

(c) Tilt top of lower front panel out and lift panel up to remove.

(d) Using screwdriver, loosen four captive panel fastener screws in junction box mounting flange.

CAUTION

Take care that wire harnesses, capillary line, and circuit breaker reset linkage are not damaged.

(e) Carefully pull junction box out far enough to gain access to button plug in end of pressure regulating valve.

(f) Remove button plug from end of pressure regulating valve.

WARNING

The following must be conducted with power on. Exercise extreme caution.

(g) Set TEMPerature control thermostat knob fully INCREASE (clockwise).

(h) Start air conditioner in COOL mode and allow suction pressure to stabilize.

(i) To adjust suction pressure, turn adjusting stem clockwise to raise (increase) pressure, or counterclockwise to lower (decrease) pressure. If pressure is low (below 56 psi) and cannot be raised by adjustment, pressure regulating valve must be replaced. If pressure is high (above 60 psi) and cannot be lowered by adjustment, test operation of the quench valve (para 5-19) before replacing pressure regulating valve.

(j) Turn unit OFF.

(k) If pressure regulating valve was properly adjusted:

(l) Reinstall button plug in end of pressure regulating valve.

- Carefully slip junction box into place and aline mounting hardware.
- Using screwdriver, tighten four captive panel fastener screws in junction box.
- Insert bottom flange of lower front panel inside the lip of the cabinet base.
- Push top of lower front panel into position.
- Using screwdriver, secure lower front panel with two captive panel fastener screws.
- Close service valves on unit.
- Remove gages or service manifold from service valves.
- Install service valve protective caps.
- Using screwdriver, secure service valve cover with four screws and flat washers.

b. Removal

Preliminary procedure: Remove compressor. (See para 5-20.)

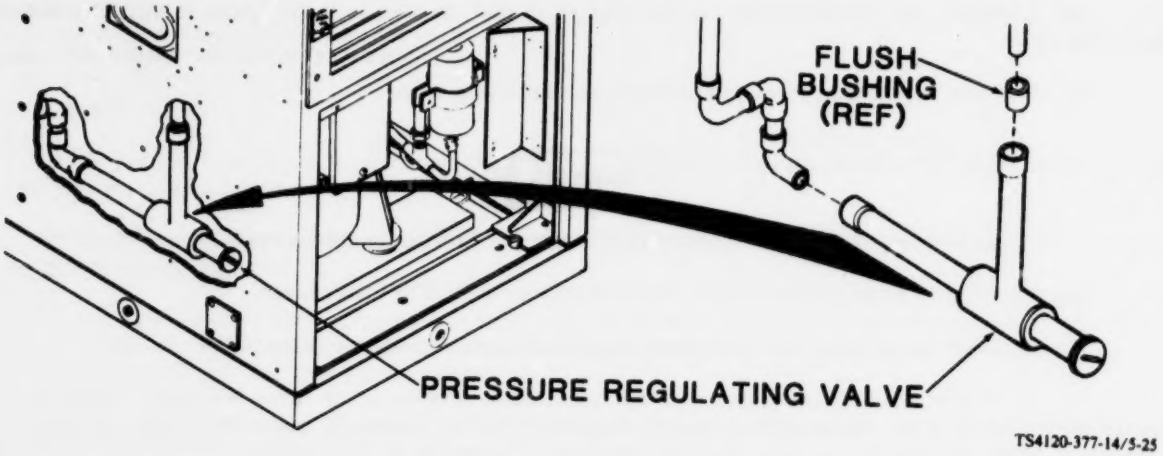


Figure 5-25. Pressure Regulating Valve

(1) Discharge the refrigeration system in accordance with paragraph 5-6.

(2) Purge the system with nitrogen and debraze the tube connections. (See para 5-7 and 5-8.)

(3) Remove the pressure regulating valve.

c. Installation

(1) Place the pressure regulating valve on the tube ends, purge the system with nitrogen and braze the tube joints. (See para 5-7 and 5-8.)

(2) Replace the dehydrator. (See para 5-13.)

(3) Install the compressor. (See para 5-20.)

(4) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(5) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

5-25. RECEIVER

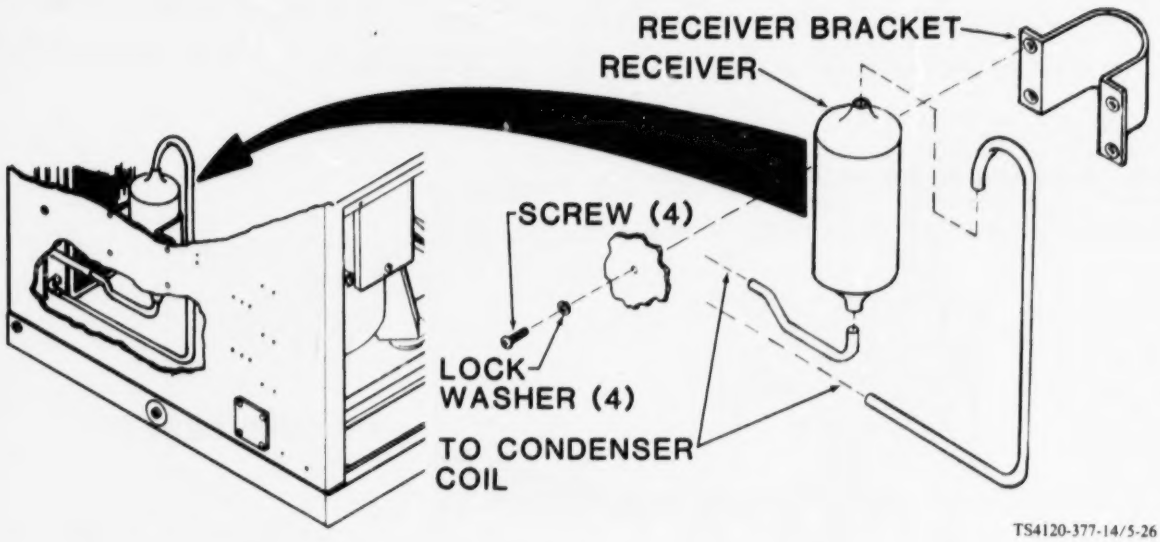


Figure 5-26. Receiver

a. Inspection

Preliminary procedure: Remove junction box. (See para 4-46.)

(1) Check for general condition and signs of leakage. If leakage is suspected, leak test per paragraph 5-9.

(2) Check that mounting hardware is secure.

b. Removal

Preliminary procedure: Remove compressor. (See para 5-20.)

(1) Discharge the refrigeration system in accordance with paragraph 5-6.

(2) Using screwdriver, remove two screws and lock washers from receiver bracket.

(3) Remove receiver bracket.

(4) Purge the system with nitrogen and debraze the tube connections. (See para 5-7 and 5-8.)

(5) Remove the receiver.

c. Installation

(1) Place the receiver on the tube ends, purge the system with nitrogen, and braze the tube joints. (See para 5-7 and 5-8.)

(2) Using a screwdriver, secure the receiver bracket to the casing side panel with two screws and lock washers.

(3) Replace the dehydrator. (See para 5-13.)

(4) Install the compressor. (See para 5-20.)

(5) Leak test all newly connected joints and those in the repair area (See para 5-9.)

(6) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

5-26. PRESSURE RELIEF VALVE

Preliminary procedure: Remove radio frequency filter. (See para 4-44.)

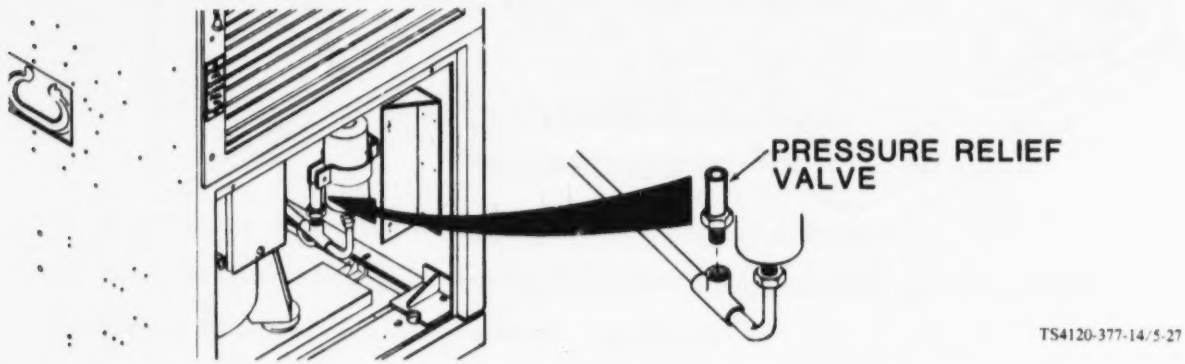


Figure 5-27. Pressure Relief Valve

a. Inspection

(1) Check for evidence of leakage. Leak test per paragraph 5-9, if leak is suspected.

(2) Check for damage. Replace if damaged.

b. Removal

(1) Discharge the refrigerant system per paragraph 5-6.

(2) Using two wrenches, hold fitting so that it is not twisted and unscrew pressure relief valve.

c. Installation

(1) Apply antisieze tape, (item 13, Appendix E) to threads of valve.

(2) Using two wrenches, screw pressure relief valve in place while holding adapter fitting.

(3) Replace the dehydrator. (See para 5-13.)

(4) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(5) Install radio frequency filter. (See para 4-44.)

(6) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

5-27. CONDENSER COIL

For inspection and cleaning of installed coil, see paragraph 4-68.

Preliminary procedures: 1. Remove receiver. (See para 5-25.)

2. Remove condenser coil guard. (See para 4-26.)

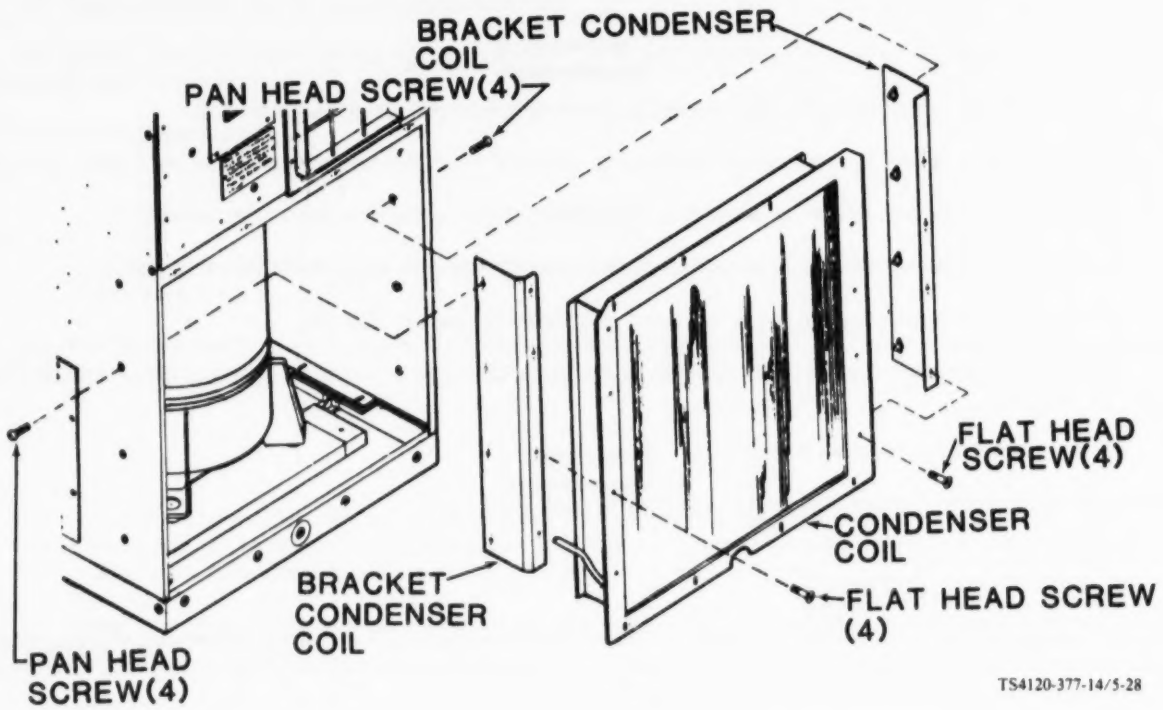


Figure 5-28. Condenser Coil

a. Removal

(1) Observe position of tubing from condenser for ease of reassembly.

(2) While purging the system with nitrogen, debraze the remaining tube joints to the condenser. (See para 5-7 and 5-8.)

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

(3) Using screwdriver, remove four pan head screws from each side while supporting condenser coil.

(4) Using screwdriver, remove the eight flat head screws from the front flanges of the coil.

(5) Using gloves to protect your hands and coil fins, carefully slip the coil and brackets from unit.

b. Repair

(1) Repairs are limited to straightening of mashed fins and repair or replacement of brackets.

(2) If fins are mashed or dented so that air flow across coil would be blocked, straighten them using a plastic fin comb.

c. Installation

WARNING

When handling coils, wear gloves to avoid cuts and reduce damage on coil.

(1) Using screwdriver, loosely attach brackets to coil with eight flat head screws. Do not tighten screws.

(2) Carefully slide condenser coil and brackets into unit and aline side mounting holes.

(3) Using screwdriver, secure brackets to casing side panels with eight pan head screws.

(4) Using screwdriver, tighten eight flat head screws in condenser flanges.

(5) While purging the system with nitrogen, braze the tube joints in positions noted at disassembly. (See para 5-7 and 5-8.)

(6) Install the receiver. (See para 5-27.)

Follow-on procedure: Install condenser coil guard. (See para 4-26.)

5-28. TUBING AND FITTINGS

The refrigeration system contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes, and a number of elbows, tees, and adapters in several sizes. Observe the following when replacing any piece of tubing or fitting in the system:

Preliminary procedure: Remove covers and panels as necessary to have access to repair area.

a. Removal

(1) Discharge the refrigeration system in accordance with paragraph 5-6.

(2) Purge the system with nitrogen and debraze the tube connections. (See para 5-7 and 5-8.)

(3) Remove the part.

b. Installation

(1) Place the replacement part on the tube ends, purge the system with nitrogen, and braze the tube joints. (See para 5-7 and 5-8.)

(2) Replace the dehydrator. (See para 5-13.)

(3) Leak test all newly connected joints and those in the repair area. (See para 5-9.)

(4) Evacuate and charge the refrigerant system. (See para 5-10 and 5-11.)

5-29. INSULATION, CASING

a. Inspection

(1) Check for broken welds, badly bent or dented parts, and cracked or broken parts.

(2) Check that plate nuts and blind nuts are in place and secure.

(3) Refer repairs to general support maintenance.

(4) Check that insulation is not loose, missing, burnt, or otherwise damaged. Replace if missing or damaged. Reglue if loose.

b. Insulation/Removal

NOTE

Prior to removal of old insulation, cut the new replacement material to size using the old item as a sample.

(1) Remove as much old insulation material as possible, by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and insulation residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

c. Installation

(1) Cut to size.

(2) Be sure that the surface to which the insulation is to be applied is clean and free of paint and old adhesive material.

(3) Coat the mating surfaces of the metal and the insulation with adhesive (item 2, Appendix E). Let both surfaces air dry until the adhesive is tacky, but will not stick to the fingers.

(4) Starting with an end, carefully attach the insulation to the metal. Press into firm contact all over.

5-30. FRESH AIR DAMPER

Preliminary procedures: 1. Remove conditioned air filter. (See para 4-33.)

2. Remove fresh air filter. (See para 4-34.)

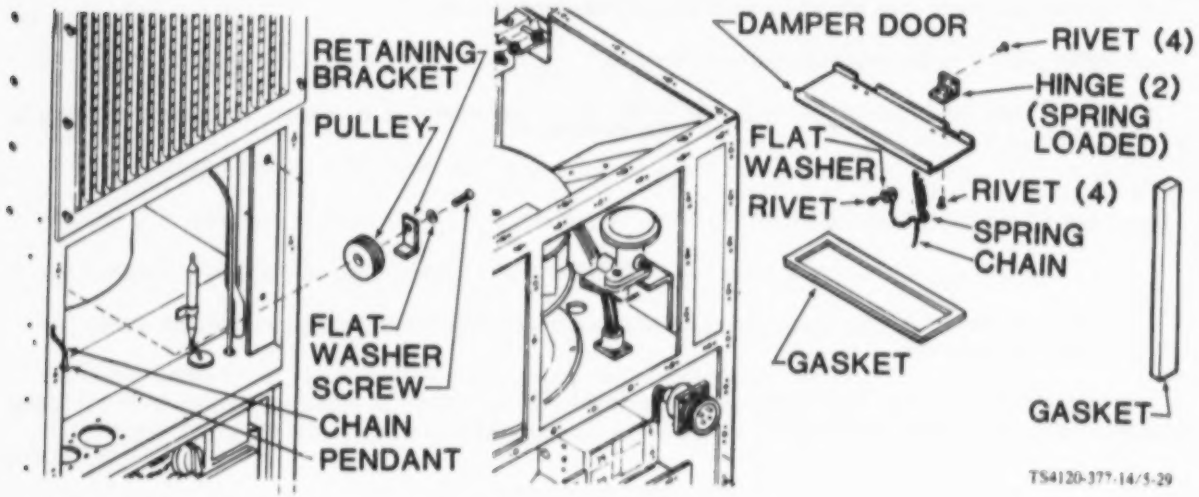


Figure 5-29. Fresh Air Damper

a. Inspection

(1) Check that chain and pendant are in place and not broken.

(2) Check that spring loaded hinges are secure and that they cause door to close when chain is released.

(3) Check that gasket is not loose, split, or missing.

(4) Check that pulley and retaining bracket are in place and that chain works properly around pulley.

(5) Repair or replace parts as indicated.

b. Hinge and door replacement

(1) Use a drill bit slightly smaller than the rivet body to drill old rivets out.

(2) Rivet replacement hinges and door in place.

(3) Check that door springs closed when chain is released.

c. Gasket replacement

(1) Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(3) Coat the mating surfaces of the metal and gasket with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

NOTE

An initial supply of adhesive is supplied as item 3, Section II, Expendable Supplies and Material List. (See Appendix E.)

(4) Starting with an end, carefully attach the gasket to the metal. Press into firm contact all over.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6-1. GENERAL

Repair parts are listed and illustrated in TM 5-4120-377-24P. No special tools are required for general support maintenance of the air conditioner. Test, Maintenance, and Diagnostic Equipment (TMDE), and support equipment, includes standard electrical test equipment, and standard pressure and vacuum gages, vacuum servicing manifolds found in any general support maintenance refrigeration facility.

Section II AUTHORIZED GENERAL SUPPORT MAINTENANCE ACTIONS

6-2. GENERAL

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair of cracked or broken welds, repair or replacement of blind nuts, nut plates, and lifting handles in casing, and blind nuts and nut plates in base. However, general support maintenance may be called upon, at times, to perform any or all of the MAC items listed for organizational and direct support maintenance for rehabilitation or overhaul of an air conditioner.

6-3. BLIND NUTS AND NUT PLATES

a. To replace blind nuts (rivnuts) use a drill slightly smaller than the body of the blind nut.

(1) Carefully drill the old blind nut out.

(2) Install replacement part.

b. To replace nut plates, use a drill slightly smaller than the body of the rivets securing the nut plate.

(1) Carefully drill the rivets loose.

(2) Remove the old nut plate.

(3) Install new nut plate with properly sized rivets.

6-4. LIFTING HANDLES

Preliminary procedures: 1. Remove junction box. (See para 4-46.)

2. Remove liquid quench expansion valve. (Only if left handle and enclosure are to be removed.) (See para 5-19.)

a. Removal

(1) Using screwdriver and wrench, remove six screws and nuts from each handle and enclosure.

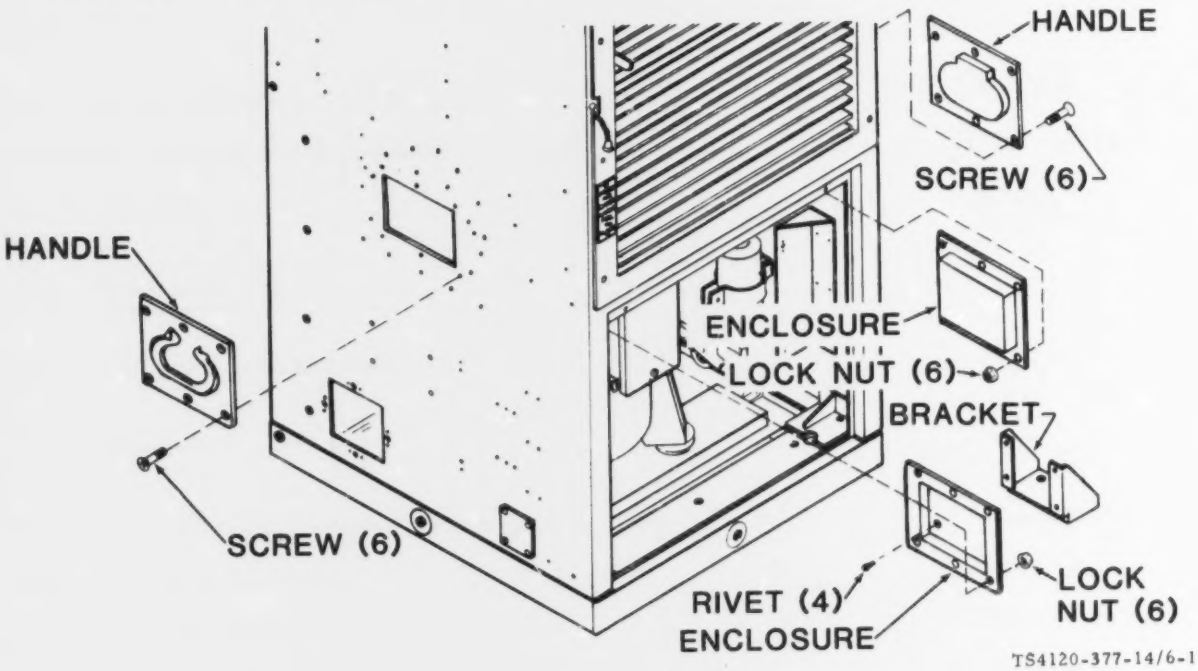


Figure 6.1. Lifting Handles

(2) Remove handle(s) and enclosure(s).

(3) If bracket on left enclosure is to be replaced:

- Use a drill slightly smaller than the diameter of the rivet body to drill out the four rivets.
- Secure the new bracket with four rivets.

b. Installation

(1) Place the handle(s) on the outside and the enclosure(s) on the inside of the casing side panel(s).

(2) Aline mounting holes.

(3) Using screwdriver and wrench, secure the handle(s) and enclosure(s) with six screws and lock nuts (each handle).

Follow-on procedure: Install liquid quench expansion valve. (Only if left handle and enclosure were removed.) (See para 5-24.)

APPENDIX A

REFERENCES

A-1. SCOPE

This Appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS

Recommended Changes to DA Publications	DA Form 2028-2
Equipment Inspection and Maintenance Work Sheet	DA Form 2404
Quality Deficiency Report	SF 368

A-3. FIELD MANUALS

Electric Motor and Generator Repair	FM20-31

A-4. MANUALS

Hand Portable Fire Extinguishers Approved for Army Users	TB5-4200-200-10
Radio Interference Suppression	TM11-483
The Army Maintenance Management System	DA Pam 738-750
Painting Instructions for Field Use	TM43-0139
Hand Receipt Manual	TM5-4120-377-14HR
Organizational, Direct Support, and General Support Maintenance Repair Parts, and Special Tools List	TM5-4120-377-24P
Administrative Storage of Equipment	TM740-90-1
Procedures for Destruction of Equipment to Prevent Enemy Use	TM750-244-3
Leak Detector, Refrigerant Gas	TM9-4940-435-14

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I INTRODUCTION

B-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceabiliy of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g. by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place, "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services[1], including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00".

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Categroy. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific task identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C	Operator or Crew
O	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

[1]Services — Inspect, test, service, adjust, aline, calibrate, and/or replace.

[2]Fault locate/troubleshoot — the process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassembly/assemble — encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category or maintenance under consideration.

[4]Actions — welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN SECTION IV

a. Column 1, Reference Code. The code recorded in Column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
01	COVERS, PANELS, GRILLES, SCREENS, AND INFORMATION PLATES								
	Covers	Inspect	0.1						
		Service		0.2					
		Repair			2.0				A
		Replace		0.5					
	Grilles	Inspect	0.1						
		Adjust	0.1						
		Service	0.2	0.2					
		Repair			2.0				B
		Replace		0.5					
	Panels	Inspect	0.1						
		Service		0.2					
		Repair			2.0				A
		Replace		0.5					
	Screens	Inspect	0.1						
		Service	0.1	0.1					
		Replace		0.5					
	Information Plates	Inspect	0.1						
		Service	0.1						
		Replace			0.3				
02	FILTERS AND MIST ELIMINATOR								
	Air Filters	Inspect		0.5					
		Service		1.0					
		Replace		0.5					
	Mist Eliminator	Inspect		0.7					
		Service		1.0					
		Replace		0.7					

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
03	ELECTRICAL								
	Control Panel and Components	Inspect	0.1						
		Adjust	0.1						
		Test		1.0					
		Repair		2.0					
		Replace		1.0					
	Block-Off Assembly	Inspect	0.1						
		Service	0.1						
		Replace		0.5					
	Wiring Harnesses	Inspect		1.0					
		Test		1.0					
		Repair		2.0					
		Replace		4.0					
	RFI Filter	Inspect		0.5					
		Test		0.5					
		Replace		0.5					
	Junction Box and Components	Inspect		0.5					
		Service		0.2					
		Test		2.0					
		Repair		4.0					
		Replace		2.0					
04	HEATERS, EVAPORATOR FAN, CONDENSER FAN, AND MOTOR								
	Heater Thermostat	Inspect		1.0					
		Test		0.3					
		Replace		0.5					
	Heater Element	Inspect		1.0					
		Test		0.3					
		Replace		1.0					
	Evaporator Fan	Inspect		1.0					
		Service		0.1					
		Replace		1.0					

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
04 Contd	Motor	Inspect		1.0					
		Service		0.1					
		Test		0.2					
		Repair			2.0				
		Replace		1.0					
	Condenser Fan	Inspect		1.0					
		Service		0.2					
		Replace		1.0				4	
05	REFRIGERATION SYSTEM								
	Pressure Switches	Test			1.0				
		Replace			6.0				
	Service Valves	Inspect			0.1				
		Replace			6.0				
	Solenoid Valves	Test			1.0				
		Repair			1.0				D
		Replace			6.0				
	Quench Valve	Test			1.0				
		Adjust			2.0				
		Replace			6.0				
	Compressor	Test			1.0				
		Repair			2.0				C
		Replace			8.0				
	Liquid Indicator	Inspect	0.1						
		Service	0.1						
		Replace			6.0				
	Expansion Valve	Test			1.0				
		Adjust			2.0				
		Replace			6.0				
	Evaporator Coil	Inspect		1.0					
		Service		2.0					
		Replace			7.0				
	Pressure Regulator Valve	Test			0.5				
		Adjust			1.0				
		Replace			6.0				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
05 Contd	Dehydrator	Inspect			1.0				
		Replace			6.0				
	Receiver	Inspect			0.3				
		Replace			6.0				
	Pressure Relief Valve	Inspect			0.3				
		Replace			6.0				
	Condenser Coil	Inspect		1.0					
		Service		1.0					
		Repaice			7.0				
	Tubing and Fittings	Inspect			1.0				
		Test			2.0				
		Replace			6.0				
06	CASING AND BOTTOM PANEL								
	Condensate Traps	Inspect		0.5					
		Service		0.8					
		Replace		0.7					
	Bottom Panel	Inspect				0.2			
		Repair				2.0			E
	Fresh Air-Damper	Adjust	0.1						
		Service		0.5					
		Repair			1.0				
		Replace			1.0				
	Casing	Inspect				0.5			E
		Repair				2.0			E
	Insulation	Inspect			1.0				
		Replace			1.0				

APPENDIX B

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS MAINTENANCE ALLOCATION CHART

(1) Tool or Test Equip. Ref. Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO stock number	(5) Tool number
		Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II:		
1	O-F-H	Tool Kit, Service, Refrigeration Unit (SC 5180-90-CL-N18)	5180-00-596-1474	(19099) SC 5180-90 CL-N18
2	O-F-H	Solder Gun Kit	3439-00-930-1638	(11103) 450K4
3	F-H	Pump, Vacuum	4310-00-098-5272	(64484) 1400B
		SPECIAL TOOLS		
4	O-F-H	Hex "L" Type Key, 6" Long Arm Series (5/32 Allen Wrench)	5120-00-189-2998	(70276) 72009

Section IV REMARKS MAINTENANCE ALLOCATION CHART

Reference code	REMARKS
A	Replace gasket and insulation only
B	Replace gasket only
C	Replace external components only
D	Replace coil only
E	Replace blind nuts, plate nuts, and lifting handles only.
	Other than those items listed above there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists components of end item and basic issue items for the air conditioner to help you inventory items required for safe and efficient operation.

C-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the air conditioner in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the air conditioner during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) — Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

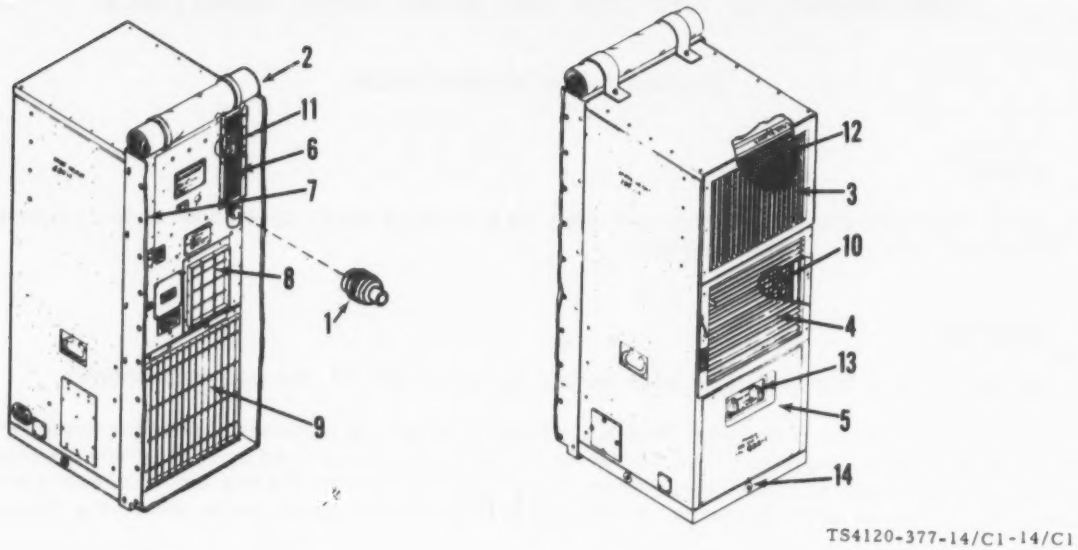
b. Column (2) — National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) — Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) — Unit of Measure (U/M). Indicates the measure used in performing the actual operation/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) — Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II COMPONENTS OF END ITEMS



TS4120-377-14/C1-14/C1

Figure C-1. Components of End Item

(1) Illus. number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
1		CONNECTOR, PLUG ELECTRICAL (96906) MS3106R22-22S		EA	1
2		COVER, AIR CONDITIONER (97403) 13222E9987		EA	1
3		GRILLE ASSY, DISCHARGE (97403) 13215E9857		EA	1
4		GRILLE ASSY, INTAKE (97403) 13215E9854		EA	1
5		PANEL, LOWER (97403) 13222E9909		EA	1
6		SCREEN, FRESH AIR (97403) 13225E8027		EA	1
7		COVER, CBR DUCT (97403) 13225E8008		EA	1
8		GUARD, CONDENSER (97403) 13225E8019		EA	1
9		GUARD, CONDENSER COIL (97403) 13215E9867		EA	1

Section II COMPONENTS OF END ITEMS (Cont.)

(1) Illus. number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
10		FILTER (97403) 13225E8026		EA	1
11		FILTER, FRESH AIR (97403) 13222E9999		EA	1
12		MIST ELIMINATOR (97403) 13219E2647		EA	1
13		CONTROL PANEL ASSEMBLY (97403) 13225E8020		EA	1
14		PLUG, PIPE (97403) 13211E8178		EA	4

Section III BASIC ISSUE ITEMS

(1) Illus. number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
		Department of Army Technical Manual; Operator's Organizational, Direct Support and General Support Maintenance Manual TM5-4120-377-14		EA	1
		Department of Army Technical Manual; Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List TM5-4120-377-24P		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I INTRODUCTION

D-1. SCOPE

This appendix lists additional items you are authorized for the support of the air conditioner.

D-2. GENERAL

This list identifies items that do not have to accompany the air conditioner and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorized the item(s) to you.

SECTION II ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM & Part Number	Usable On Code	(3) U/M	(4) Qty Auth
7520-00-559-9618	Cotton Duct Case		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I INTRODUCTION

E-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the Air Conditioner. These items are authorized to you by CTA50-970. Expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS

a. Column (1) — Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use silicone adhesive sealant, item 1, Appendix "E."

b. Column (2) — Level. This column identifies the lowest level of maintenance that requires the listed item.

C — Operator/Crew
O — Organizational Maintenance
F — Direct Support Maintenance
H — General Support Maintenance

c. Column (3) — National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) — Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) — Unit of Meausre (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O		Silicone Adhesive Sealant RTV General Purpose MIL-A-46106, Type I	
2	O		Solder, Lead-Tin, QQ-S-571 Type SN60WRP2	
3	F	3040-00-664-0439	Adhesive, General Purpose 1 pint container	ea
4	F	6830-00-292-0732	Nitrogen	cy
5	F		Brazing alloy, silver QQ-B-654, grade 0, I or II	
6	F		Brazing alloy, silver QQ-B-654, grade III	
7	F	3439-00-640-3713	Flux, brazing O-F-499, type B	
8	F	5350-00-192-5047	Abrasive cloth	pg
9	F	7920-00-205-1711	Rags	
10	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb. (Refrigerant-22) BB-F-1421 type 22 (81348)	cy
11	F		Tape PPP-T-60, type IV, Class I	roll
12	F	6830-00-872-5120	Trichloromonofluoromethane Technical: w/cylinder 50 lb. (Refrigerant-11) BB-F-1421 Type 11 (81348)	cy
13	F	8030-00-889-3534	Tape, Antisieze, Polytetrafluoroethylene MIL-T-27730, size I	roll
14	F		Lubricating Oil VV-L-825, type IV	qt
15	F	9150-00-058-2301	Oil, Vacuum pump, Duo-seal	qt
16	O	3439-01-045-7940	Flux, Soldering, Liquid Rosin Base, MIL-F-14256	qt

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4120-377-14	19 Sep 83	Air Conditioner, Vertical, Compact, 18,000 BTU/HR 208 Volt, 3 phase, 400 Hertz

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.
B1		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE
JOHN DOE, PFC (268) 317-7111	JOHN DOE JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 053733-000